ELECTRICAL REVIEW
THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXXII. No. 3411. APRIL 9, 1943 6d. WEEKLY

Secondary Stations

Their Place in the National System

ALMOST a merit has been made of the inherently irregular load curve of electrical demand by the interconnection of power stations through the grid. The outstanding feature, from the aspect of technical development, is that the annual growth of load can be catered for by the provision of new generating plant embodying the most advanced practice, which takes over the long-hour loads (though not supplying a proportionate number of kWh) while the older plant is progressively relegated to deal with intermittent demands. For the base-load stations high thermal efficiency is of the first importance; for the others the over-riding consideration is that their standing charges have to be met in any case, so that their output costs little more than the fuel charges.

One-Sixth of the Output

In between the continuously running base-load stations, which in 1939 produced about three-quarters of the total output, and those which come in only on the winter peaks, there are many (about one-third of the total) which run only by day throughout the year. As these two-shift stations generate about one-sixth of the kWh sent out (a proportion that seems likely to increase) their operating efficiency is of some consequence. Indeed, it seems probable that any appreciable operating savings in future must be looked for in this direction. Nevertheless, the achievement of the best overall results for secondary stations presents many difficult problems that are not found with steady load conditions, and the attention paid to these by Mr. R. A. W. Connor in his I.E.E. paper last week was certainly justified.

Of the author's suggestions for the promotion of efficiency in such stations, probably the one that most needs underlining (as it often involves some expenditure) is that relating to the use of instruments for indicating and passing on from one point of the station to another immediate information regarding the state of load and preparedness to meet sudden changes.

Regard for the Future

Allowing for a doubling of the demand within the next seven or eight years, it is clear that several front-line stations will become two-shift stations before the end of their useful life, so that the efficiency of this class and therefore of the generation for the whole country should go up. This also implies that new stations should be designed with an eye to ultimate operation on intermittent loads as well as for thermal efficiency.

The engineering position is, however, largely dominated by uncertainty as to the future cost of coal delivered on site, which, under regional control arrangements, will probably sometimes affect the usage of a station more nearly than will thermal performance. No doubt, too, with extensions of old stations with modern plant on the best sites, the generating set will come to be regarded as the unit, rather than the station as a whole—a logical development of the idea of the grid as extended busbars.

The good results of the policy discussed in the paper, which has involved some sacrifice of individual prestige, is shown in the steadily declining cost per kWh sent out. But technical policy alone would not have been enough without the team spirit shown by the engineers of the undertakings concerned (of whom Mr. Connor is one) acting in co-operation with the Central Electricity Board to produce the lowest generating costs for the country as a whole.

Future Steam Conditions

FOR more than a decade boiler pressures in new or extended generating stations have, in general, been stabilised at about 650 lb. per sq. in. It seems probable, however, that but for the war, the time would by now have been ripe for a further move upwards. One may deduce from Mr. F. Shakeshaft's section of the Cantor Lecture that an era of elevated steam conditions (perhaps approaching 1,500 lb. per sq. in. and 1,000 deg. F.) will follow the termination of hostilities. This will depend upon the availability of the less expensive molybdenum steel required for withstanding the high temperatures that are associated with high pressures in order to avoid excessive wetness of steam in the final stages of the turbine.

Switchgear Requirements

MUCH of the advantage gained by the electricity supply industry through having evolved gradually for more than sixty years is lost if differences in local requirements for plant persist after they have outlived their validity. Still more is this the case when departures from manufacturers' standard lines are called for in new installations to meet minor variations from normal or, perhaps, even personal preferences. Taken alone these may be sound enough technically, yet the need to provide for the large variety of switchgear arrangements referred to by Mr. C. W. Marshall in his Cantor Lecture can only keep up costs of production at the expense of users as a whole.

Gas-filled Cables

IN our March 26th issue we quoted from a United States contemporary a reference to limitations in the use of reinforced lead-sheathed cable at higher pressures. This limit does not apply, however, to British practice, as we are informed by W. T. Glover & Co., Ltd., that they have installed many miles of 132-kV cables for operating with an internal gas pressure of 200 lb. per sq. in., the original installation on the grid having been in commission for about five and a half years without expenditure on maintenance or supplementary gas supply.

Coal Wages and Prices

THERE must be general satisfaction at the agreement of the coal owners and miners to settle their differences amicably on a national basis, but it is to be hoped that the new tribunal will have some regard to the consumer. During the last four or five years wage increases have been conceded rather freely by the owners because they have been able to pass on the whole of them to their customers. These increases, by a sort of natural law, seem to have been magnified in transit, as every supply undertaking knows.

Coal Stocks

AT the beginning of 1942 electricity supply undertakings in the United States had, according to the *Electrical World*, coal stored for 67 days' use. This was not considered enough, having in mind transport difficulties during the last war. Stocks were therefore built up, month by month, until on December 31st the reserve was equivalent to requirements for 110 days. Traffic interruptions in Great Britain are certainly not less likely and support is thus given to objections that have been raised to undue reduction of the margin here. Individual stations may, of course, be worse off than a gross figure for the whole country may suggest.

A Minimum

THE value to electrical engineers of an understanding of ordinary business methods was one of the points made by Mr. A. Shaw in his chairman's address to the I.E.E. Tees-side Sub-Centre. The usual proportion of technical work to the whole of his duties is put at about 20 per cent. which is probably not far out. It is important that young engineers should realise this and that, while sound technical knowledge will always be an indispensable minimum, it provides only the starting point for the exercise of other personal qualities.

After-Diversity Demand

Its Relation to Diversity Factor

By P. Schiller

IN his I.E.E. paper, "Towards the 'Correct' Domestic Multi-part Tariff" (see *Electrical Review*, February 5th) the writer suggested that in the field of domestic tariffs not related to individual consumers' maximum demand (m.d.) the hitherto favoured quantity of diversity factor should give place to "after-diversity demand." It may be useful to elaborate this a little further.

Diversity factor was originally defined as the quotient resulting from dividing the sum of the individual m.d.'s (within a given period) of a group of consuming units of similar characteristics by their collective m.d. (within the same period). Subsequently, the term has also been used with the above denominator replaced by the collective demand at a definite time, other than the time of group m.d. The definite time has usually been the time of m.d. on an undertaking or a distribution system. Thus, diversity factors computed according to the modified definition ought always to have been accompanied by a statement as to time of reference. This has hardly been observed, hence confusion has arisen regarding the meaning of diversity factors, especially as quoted in connection with the domestic load and its components.

To give an example, a diversity factor of 9 to 10 of a group of cookers without further qualification may have been based on the collective m.d. of the group (which ordinarily obtains around 1 p.m. on a Sunday), the collective demand at the time of the original lighting peak (6 to 7 p.m.), or of the now also disappearing late-afternoon peak.

Ambiguity is enhanced by the fact that although any exact definition of diversity factor has so far been based on individual m.d.'s, in practice connected load, or rated input of appliances, has often been taken instead. For water heaters with a single heating element, for instance, this confusion is of little consequence, since for practical purposes the rated input may be deemed to be equivalent to m.d. For cookers, conditions become more involved. There is nothing to support the assumption that within a given period each cooker will produce an m.d. equal to the total rated input of oven, grill and boiling-plates. If, however, total connected load instead of sum of individual m.d.'s is related to collective demand, the result is no longer a diversity factor but the reciprocal of a demand factor, which is defined by the B.S. Glossary as "the ratio of the m.d. of an installation or supply system to the connected load."

With cookers identification of individual m.d. and connected load may still pass, but with space-heating loads correct application of diversity factor is impracticable. There is a parallel between lamps and space heaters, inasmuch as the number installed by an individual domestic consumer may vary. As the diversity factor of domestic lighting has always been related to individual domestic consumers' m.d. for lighting and not to installed lamp capacity, so for domestic space-heating loads one should expect diversity factor to be based on individual domestic consumers' m.d. for space-heating. But whereas individual consumers' installed lamp capacity can be related to m.d. created by it, this is not possible with space heaters. Thus, the only way of producing factors in respect of domestic space heating without measuring individual consumers' m.d. is to resort to connected load, and hence to demand factor, or its reciprocal as yet unnamed.

Further complications arise from the tendency of diversity factors to vary with

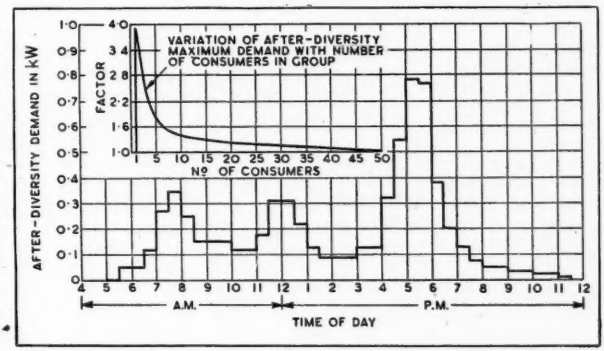


Fig. 1.—After-diversity demand (half-hour periods) of cookers (U.S.A.)*

* A curve typical of conditions in this country would have its maximum around mid-day.

the rated input of the appliances concerned. Take for instance two groups of domestic cookers operating under exactly similar conditions, the individual oven and boiling-plate rated inputs of one group being double those of the other. Then during the same cooking process the lower-rated elements will be full on for relatively much longer periods, the relative overlap of the individual full-on periods will be correspondingly larger, and the 30-min. m.d.'s of the two groups may well be approximately equal. But the sums of the individual m.d.'s of the cookers of the two groups will differ considerably, and consequently also the resulting diversity factors. It is, therefore, fundamentally wrong to state a diversity factor for cookers in general. But if the m.d. of each group is divided by the number of cookers constituting the group, the two values of kW per cooker will be of the same order; hence a single value of this kind may be stated with sufficient accuracy for cookers in general. Similar considerations can be made in connection with domestic water heaters, refrigerators, etc.

The quantity representing the quotient of m.d. of a group of consuming units of similar characteristics and number of units constituting the group has been called in America "after-diversity demand." It appears preferable to term it "after-diversity maximum demand" (A.D.M.D.), and to use after-diversity demand (A.D.D.) in a general sense for describing the quotient of the group demand at a specified time or occasion and the number of units forming the group.

In addition to having the advantage mentioned, operation with this quantity also obviates all inaccuracy of expression and ambiguity of meaning attendant on the conventional use of diversity factor. A concrete concept (*e.g.*, 0·5 kW per cooker) is substituted for an abstract one (*e.g.*, diversity factor of 10). Besides, while determination of and operation with diversity factors requires a knowledge of individual m.d.'s, usually unobtainable, after-diversity demand is based on numbers and collective demand—indices usually ascertainable. Moreover, when A.D.D. curves relative to typical classes of appliances have been derived, combined load curves, can be synthesised and thus the load on distribution plant can be predicted.

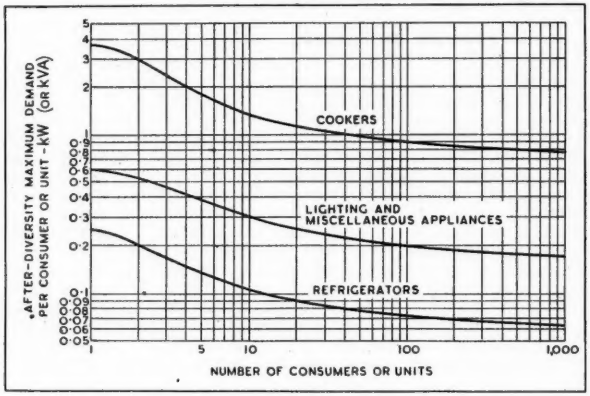


Fig. 2.—A.D.M.D. plotted against number of constituents

In the same way as diversity factor, A.D.D. increases if the number of units involved becomes relatively small. The curve in fig. 1 applies to cooker groups of such magnitude that further increase in number of constituents has no appreciable effect. For smaller numbers the multipliers (actually applying to the A.D.M.D. value only) plotted in the inset are to be used.

HOURLY DEMAND-VARIATION FACTORS: URBAN DOMESTIC CONSUMERS

Hour	Lighting and miscellaneous small appliances per cent.	Refrigerators per cent.	Cookers per cent.
1 a.m.	16	83	1
2 a.m.	10	78	1
3 a.m.	8	78	1
4 a.m.	8	78	1
5 a.m.	12	76	1
6 a.m.	20	75	5
7 a.m.	42	76	24
7.30 a.m.	58	77	48
8 a.m.	55	78	51
9 a.m.	45	78	26
10 a.m.	41	79	23
11 a.m.	40	84	24
12 noon	32	89	47
1 p.m.	30	89	24
2 p.m.	33	89	15
3 p.m.	36	89	13
4 p.m.	44	89	21
5 p.m.	69	90	62
5.45 p.m.	90	91	100
6 p.m.	95	92	95
7 p.m.	100	98	30
7.30 p.m.	99	100	16
8 p.m.	98	95	11
9 p.m.	85	90	6
10 p.m.	69	88	4
11 p.m.	50	89	4
12 midnight	27	90	2

Another way is to plot A.D.M.D. against number of constituents, and to tabulate multipliers relative to hourly variation. Fig. 2 and the accompanying table (from Edison Electric Institute Report No. H6) illustrate this for American conditions. For example, to estimate the load on a distribution transformer supplying 25 lighting installations, 10 cookers, and 20 refrigerators, from fig. 2 the following A.D.M.D. values (five-minute periods) are taken:—0·24 kW per lighting installation, 1·2 kW per cooker and 0·1 kW per refrigerator. The first value is multiplied by 25, the second by 10 and the third by 20, and by means of the table the three component curves shown in fig. 3 can be developed, giving in combination the collective daily load curve.

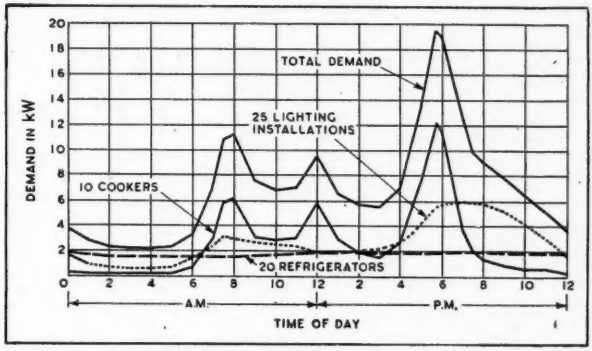


Fig. 3.—Synthesis of daily load curve

Application in this country of this method of load synthesis is handicapped by the difficulty of deriving A.D.D. curves for space-heating installations in cold snaps. However, this does not detract from the general superiority, in comparison with diversity factor, of operation with A.D.D. as a quantity.

There are, of course, fields where diversity factor still remains indispensable, and nothing can be said against the use of the general term " diversity " so long as it is not confused with the mathematical quantity of diversity factor. It is chiefly in the sphere of domestic loads and tariffs that, wherever possible, diversity factor ought to be replaced by after-diversity demand.

Wellington Electricity and Tramways

FROM Wellington, New Zealand, we have received a copy of the combined annual reports of the City Tramways and Electricity Departments for the year ended March 31st, 1942. These are presented by Mr. L. B. Hutton, M.C., M.I.E.E., who succeeded Mr. M. Cable, M.I.E.E., M.I.Mech.E., as general manager on his retirement towards the end of the year under review.

Statistics included in the Electricity Department's report show that 128·9 million kWh was supplied during the year, an increase of 3·3 million kWh. In consequence of measures taken for defence purposes lighting supplies dropped by nearly three million kWh to 17·4 million kWh, but against this reduction there was an increase of 5·6 million kWh in sales for heating purposes, which aggregated 79·3 million kWh, and power consumption (20·4 million kWh) was also greater. In spite of the higher output the m.d. declined from 36,948 to 35,312 kW and the annual load factor consequently improved from 42·4 to 45·8 per cent.

During the year alterations were made in the commercial lighting and domestic tariffs which, in a full year, will benefit consumers by £27,500. The change in the commercial lighting tariff also had the advantage of making the tariff steps even pounds.

These concessions and the reduced lighting sales were responsible for a fall in total revenue of £14,673 to £450,639. Working expenses increased by £7,681 to £344,158, and after providing for capital charges and special expenditure the credit balance (£24,286) was £22,577 lower than in the previous year.

The average revenue per kWh sold fell from 0·88d. to 0·82d, the figures for the different categories of supply being : domestic 0·52d.; commercial lighting 2·11d.; commercial heating 1·75d.; power 0·85d.; and tramways 0·65d.

Growth in Tram Traffic

The report of the Tramways Department records that through the restriction of motor traffic the trams were called upon to carry nearly seven million more passengers than in the last normal year (1938-39). Altogether, tram journeys aggregated 50·2 million, in addition to which there were about two million journeys in motor buses. Average receipts per tram-mile increased by 1·62d. to 28·77d, while working expenses, at 21·53d., showed a smaller rise (0·33d.) Total revenue for the year was £549,698, an increase of £19,343, and there was a credit balance of £7,304 on the year's working as against a previous deficit of 3,607. While the number of trams in stock remained at 226, there were fewer motor-buses (46 against 55).

At the end of March there were 63 employees of the Electricity Department and 211 of the Tramways Department on war service, 122 being overseas, and it is recorded with regret that four have been killed on active service.

Lighting Fittings

Association's Annual Report

DURING 1942 the activities of the Electric Light Fittings Association were again confined mainly to the Industrial and Commercial Section. Apart from aiding the war effort, the Association has given consideration to the re-planning of the industry after the war, from the points of view of both consumer and distributor. Accordingly, the Council has been formally constituted the E.L.F.A. Post-War Reconstruction Committee to assist and advise Government Departments and the industry in general in all matters coming within the Association's scope. The sections are to consider their appropriate problems and co-ordination will be achieved through the main committee.

In this connection the Association is working with other bodies. It is directly represented on the Electrical Industry Co-ordinating Committee on Post-War Reconstruction, and evidence has been prepared on post-war lighting for the Lighting Committee of the Department of Scientific and Industrial Research, dealing with small domestic premises, schools and commercial premises; other applications are to be dealt with. The Association has also supported the "Rebuilding of Britain" exhibition organised by the R.I.B.A.

The enrolment of three more members is recorded in the report—C. M. Churchouse, Ltd., Dernier & Hamlyn, Ltd., and Venreco, Ltd.

Although endeavours have been made to keep price levels steady, increases in costs of production have made price advances necessary and the report shows the up-to-date position in this respect. Mention is made of the drastic reduction under the Limitation of Supplies (Miscellaneous) Order in the quota for commercial fittings and the prohibition of the manufacture of decorative fittings and table lamps. For essential war work the commercial fittings quota may be exceeded and in collaboration with the Board of Trade the Association has introduced a special form of application for licences.

Referring to the arrangements for applying purchase tax to the list prices of fittings, the report pays a tribute to Mr. A. J. Burbidge, chairman of the Ornamental and Decorative Section, for his excellent work with the Board of Trade and H.M. Customs and Excise.

The Joint Register of Approved Fittings Wholesalers continues to function satisfactorily, and recent negotiations with other manufacturing interests and the Electrical Wholesalers' Federation leads to a hope that the Association's trading code will be adopted by the entire fittings trade in due course.

The E.L.M.A./E.L.F.A. Joint Standing Committee continues to meet when necessary and the Export Group is still in operation to give assistance to members and other fittings manufacturers on such matters as licences and the supply of materials for export work.

Agreement has been reached regarding the trading conditions to apply to 5-ft. fluorescent discharge lighting fittings and Schedule E/3 has been established for this purpose. The need for a separate stage-lighting section is under consideration.

West Midlands J.E.A.

Mr. C. Heathcock's Review

WE report in our "Personal" section the election of Mr. C. Heathcock as chairman of the West Midlands Joint Electricity Authority. Upon taking the chair Mr. Heathcock surveyed the development and operations of the Authority since its inception in 1926. He said that the primary object was joint generation for the four principal electricity undertakings in the area—the Midland Electric Corporation, Ltd., and the Corporations of Wolverhampton, Walsall and West Bromwich.

The authority was not the first to be established but it provided the first instance in which a joint authority had come into existence with plans for the electrical development of its district settled in advance by the co-operation of the parties concerned, both company and municipal undertakings. It was to-day the largest producing J.E.A. in the country. The representatives of the constituent bodies had worked throughout as a happy team and the Authority operated as efficiently as a carefully selected board of directors. The Authority had become a clearing house for electricity supply problems in the area and had framed policies of electrical development.

The original scheme of joint generation was considerably modified so that the J.E.A. could assist in meeting the large demands of the grid system and many millions of kWh were exported annually to other areas. The Authority's scheme was admitted to have been the more economic; this was reflected in the settlement for 1941 recently agreed with the Central Electricity Board. Had they purchased their supplies from the grid at the general grid tariff the cost would have been £1·83 millions. If they had purchased at the special rates applicable to selected station owners the price would have been £1·58 millions. The amount actually paid, the hypothetical cost under the original scheme of the Authority, was £1·30 millions.

The Authority had certainly justified its existence in the realm of rural electrification. It now had 950 miles of lines and cables taking supplies to 23,000 consumers, of which 600 were electrified farms mostly with isolated spur lines. Last year it supplied over 82 million kWh to that area. Every village with a population of 250 inhabitants had a supply, as well as many smaller hamlets.

Mr. Heathcock concluded by saying that it was probable that questions of post-war development would have to be dealt with during his period of office. He did not consider that these should raise major difficulties and he believed that the Authority would be able to negotiate without outside help or interference.

Domestic Heating

Sir John Dalton Proposes a "Balanced" System

THE future of the domestic heating market was the subject of an address delivered to the Fuel Luncheon Club in London on March 25th by Sir John Dalton (director and manager of the County of London Electric Supply Co., Ltd.), who is Regional Fuel and Power Controller for London and South-East England.

Sir John endeavoured to assess the scope of the domestic market for heat and power, which accounted for two-fifths of the coal consumed in this country. A considerable revenue was involved, which was effectively controlled by the types of appliance installed in houses at any given period. The market for those appliances was very stable as their life ranged from 10 to 20 years. Therefore if, as was anticipated, an enormous number of new houses was to be built after the war, the selection of services in them would have a decisive influence on the trend and nature of domestic fuel consumption for many years thereafter.

Suggested Co-operation

Sir John's appeal was directed to the necessity for some balance between the use of coal, gas and electricity in that domestic heating market which would be most advantageous in the national interest and most advantageous to the three industries concerned. He suggested that one way to proceed with consideration of fuel requirements in post-war building plans was, first, to determine this balance and then to encourage those developments which would tend to favour its realisation. The only way in which to realise this was for the three industries concerned to get together and beat out to a conclusion a scheme to achieve such a balance and then to get the Ministry of Fuel to bless it on national and economic grounds.

There were extremists in each branch of the fuel industry. Their views, which appeared to Sir John as unbalanced as they were antagonistic, were likely to result, unless indeed the fuel industry itself took a part in the matter, in the imposition of some rigid and probably wrong direction on the industries making up the fuel interests.

The economics of the house coal position was in Sir John's opinion an influencing factor on the whole problem. It comprised some 40 to 50 million tons of coal which attracted the highest prices. House coal commanded pit-head prices some 4s. per ton higher than the price paid for gas and electricity coal. This was equivalent to over £9,000,000 per annum, which was a sum greater than the whole realised surplus of the coal industry out of which all wages above the basic minimum, and profits, had to come. It seemed clear, therefore, that any disturbance of any considerable proportion of the house coal trade by gas or electricity must throw more than a spanner into the economics of the coal industry. It might, indeed, and Sir John thought it would, increase the price of gas and electricity coal.

The Open Fire

Apart from this economic factor it was about time that gas and electricity people frankly admitted that the coal fire in the house was one of the prejudices which every Britisher was entitled to. In fact, there was nothing which gas and electricity experts had or could produce which could touch the comfort and joy of an open grate burning raw coal.

An important factor, not only in the economic but also in the æsthetic sense, was the matter of settling as quickly as possible a new type of open grate. Sir John understood that certain interests had, indeed, got very far with a continuous burning open grate, and he urged the coal industry to get a move on so that it would be able to bring into conference with the other two industries a very valuable asset.

He was deeply interested in the house coal market, but only from the point of view of what was best for the three industries which shared the domestic heating load. The house coal consumed in open fire grates must be of the order of some 50 per cent. of the whole coal used by the domestic market in all forms for heating and power, and neither the electrical industry nor the gas industry could take over itself, or even divide among themselves, that large heating load from the economic point of view. Therefore it followed that the house coal trade was indispensable not only to the coal industry but also to the gas and electrical industries.

An Uncertain Load

It was a fact, speaking only for the electricity industry, that it was embarrassed by the uncertain and fluctuating load due to space heating as the result of cold spells during the winter. Overnight at the end of the very cold spell in the early part of 1942 the electrical load of the industry dropped just about 1,000,000 kW as the result of the sudden cessation of the cold spell. (Sir John appealed to Sir Archibald Page on this point and Sir Archibald confirmed the figures.) Sir John said he was interested during that

cold spell to assess as nearly as he could the excess consumption of coal due to that snap heating load and his estimate was that the gas industry required 25,000 tons per week more coal and the electricity industry required 79,000 tons a week more coal to meet that heating load. It appeared to be obvious that if that load grew much more and became out of hand, both the gas and electricity industries would be involved in further capital expenditure on plant to meet a peak which would only occur at very infrequent intervals. In short, it was a present for the house coal market and an embarrassment to the other industries.

Sir John said that if he was right in making this suggestion for the need for conference and early agreement on this question of a balance to be found among the three great fuel industries, it seemed obvious to him that one of the fundamental points to be pressed for with all building authorities in respect of all new building plans should be adequate storage for house coal.

In making these suggestions they would, if they met with the approval of the three industries, be travelling along the lines that the Minister himself adumbrated in a recent speech. The Minister undoubtedly wanted all the fuel industries to be complementary one to the other so far as was possible. There must obviously be a certain amount of competition which would be healthy for all, but because in so many cases competition was wasteful, all interested in the fuel industries would be very foolish if they did not try to eliminate it.

Sir D. Milne Watson Agrees

Sir David Milne Watson, the chairman, proposing a vote of thanks to Sir John, said he was pleased that views had been put forward which he himself had expressed over and over again before the Fuel Luncheon Club and elsewhere, although at times he had had some very unpleasant rebuffs for doing so. He welcomed Sir John's broadminded outlook because he felt there was no doubt it was high time that the three great fuel industries of coal, gas and electricity got together and produced something to be placed before the authorities on this matter. He sincerely thanked Sir John for his frankness and for giving so much excellent advice.

E.P.E.A. Activities

Sixteen-hour Shifts Discussed

AT a recent meeting of the National Executive Council of the Electrical Power Engineers' Association reference was made to the fact that during the period of the heavy air-raids on London travelling difficulties made it necessary for some members to continue on duty for sixteen hours. It was said that although this appeared much too long a shift some members considered it an advantage as it enabled them to have a 32-hour break before their next turn of duty. The N.E.C. was asked to obtain a medical report upon the effect on engineers of working under such an arrangement, but it decided to take no action in the matter.

Proposed New Schedule

At the same meeting a motion was put forward calling for a revision of the National Joint Board Schedule, to embody recommendations forwarded by all divisions of the Association in 1938. Although there was strong support for the proposal the view was expressed that the present time was not opportune for such a move. One point raised against it was the possibility of a Distribution Bill which would make fundamental alterations in the industry after the war. It was decided, however, to accept the motion.

The matter was raised at a recent meeting of the South Coast Section of the Association, when a notice of motion was drawn up for the consideration of the Southern Divisional Council. This called for the negotiation of a post-war schedule including the following provisions:—It should contain many more designated posts than the existing Schedule; details of these posts should be stated; the incremental advances should be greater and more frequent than at present, for example, five increments in ten years; the basis of classification of outside staffs should be on units sold; and the normal working week for shift workers should not exceed forty hours.

A Paisley Engineer's Salary

The *Electrical Power Engineer* reports a recent arbitration in connection with the salary of an engineer in the mains department of the Paisley Corporation undertaking. As the result of a claim put forward by the E.P.E.A., the Scottish District Joint Board decided that this engineer should be allocated to Class G of the Schedule and his grade raised from 6 to 5. The Paisley Corporation accepted this but maintained that it was only a temporary measure pending the appointment of an assistant engineer and manager. Upon this appointment the engineer was reduced in classification from Grade 5 to Grade 7.

When the matter again came before the District Joint Board the Board decided that the original decision should stand but as the Corporation declined to accept this decision the matter was referred to arbitration. The arbitrator, after reviewing the circumstances, held that the payments to be made and the classification justifying such payments were matters for careful consideration and that the Board, a competent body representing both sides, had given that consideration, and he accepted the Board's decision as a proper one and awarded that it should operate as from December 4th, 1940, the date on which it was made.

Modern Power Stations

Turbine Operation and High-Voltage Circuit Control

IN the third of the Royal Society of Arts series of Cantor Lectures on "The Modern Power Station," on March 29th, Mr. F. Shakeshaft discussed the mechanical equipment of the turbine house. During the twelve years ended in 1935, station efficiencies on a generated basis had risen, he said, from 18 to 29 per cent., due mostly to improvements in the turbine house.

The construction of the grid had accelerated standardisation of output of sets and steam conditions. Turbine stop-valve conditions had been adopted of 400 lb. per sq. in. and 800 deg. F. for 20-MW sets and 600 lb. per sq. in. and 850 deg. F. for larger units, with 1,400 and 1,900 lb. per sq. in. and 960 deg. F. in a few cases. Cooling tower stations using treated sewage effluent were now little inferior in efficiency to river stations, and this allowed greater latitude in siting new stations.

Axial flow turbines of the impulse, impulse reaction and reaction types had been developed as multi-cylinder designs with double-flow exhaust up to 60 MW at 3,000 RPM and 105 MW at 1,500 RPM, whilst radial flow double-rotation reaction turbines had been developed up to 30 MW at 3,000 RPM and 50 MW at 1,500 RPM.

Improvements in Blading

On 600 lb. per sq. in. feed-heating cycles internal efficiencies of 83 per cent. or more were obtainable with annual availability factors better than 90 per cent. A contribution to high blading efficiency had been the use of a large number of high- and intermediate-pressure stages with reduced steam speeds, blade shapes offering low resistance to steam flow, the reduction of inter-stage leakage by end-tightening of rotating blade rings in single-flow cylinders, together with radial gland strips over the high-pressure blade shrouding, the maintenance of true axial steam flow by increasing the degree of reaction from root to tip of the blading in order to oppose the centrifugal force of the steam, and the improvement of stage draining in low-pressure cylinders.

Devices had been introduced to anticipate the action of the normal speed governor in cutting off steam on sudden reduction of load (thereby preventing tripping out on overspeed) and to prevent damage to the exhaust end by reducing steam supply on failure of vacuum.

To illustrate its economies the regenerative feed-heating cycle might be regarded as a combination of two parts. In the first, steam flowed through the turbine to the condenser, part of the initial heat content being converted into mechanical work by the blading and the remainder being lost to the circulating water. The heat-consumption rate per kWh generated varied from 13,930 BThU for initial conditions of 200 lb. per sq. in. and 550 deg. F., to 9,760 BThU for 1,500 lb. per sq. in. and 1,000 deg. F., with 29 in. vacuum in each case. In the second part a smaller quantity of steam flowed in parallel with the main quantity, but was bled off to feed heaters at several pressures, part of the initial heat being converted into mechanical work and the remainder being returned to the boiler through the medium of the main condensate from the first part of the cycle. In this case no heat was lost and the rate of heat consumption was always 3,554 BThU per kWh generated, assuming a mechanical efficiency of 99 per cent. and an alternator efficiency of 97 per cent.

A turbine developing 50,000 kW at the spindle (48,000 kW at the alternator terminals) at its economic rating, with initial steam conditions of 600 lb. per sq. in. and 800 deg. F. and feed heating from 80 to 340 deg. F. in five uniform stages, would generate 42,590 kW on condenser steam at a heat rate of 10,940 BThU per kWh, and 7,410 kW on feed-heating steam at a heat rate of 3,554 BThU per kWh. The combined heat rate would be 9,820 BThU per kWh.

Although efficiency could be increased by generating a maximum proportion of the total power on the second part of the cycle (*i.e.*, by adopting the highest possible feed temperature), the economic feed temperature was appreciably below the boiler saturation temperature on account of the cost and complexity of additional heaters having to be balanced against progressively diminishing thermal gains.

A Two-fold Advantage

Higher initial steam conditions increased not only the efficiency of the condensing part of the cycle but also, simultaneously, the proportion of total power developed on the feed-heating part. For 1,500 lb. per sq. in. 1,000 deg. F. with seven-stage heating to 444 deg. F., this proportion would be raised to 9,650 kW out of 50,000 kW and the overall heat rate would be about 8,600 BThU per kWh.

In the modern condenser the large area of tube surface minimised the pressure drop and resulted in a condensate temperature at least equal to the corresponding vacuum temperature. The economic temperature difference between the inlet water temperature and the vacuum temperature was usually about 23

deg. F. with high pumping power, diminishing with lower initial and running costs of the circulating water system. A tube surface of 1 sq. ft. per kW was often specified, although a clean water supply or intermittent chlorination might reduce the area to nearer 0·75 sq. ft.

Feed heaters on a modern 600 lb. per sq. in. cycle condensed about one-third of the quantity of steam handled by the condenser but, owing to the higher temperature of condensation and the greater temperature difference, the surface was only about 0·1 sq. ft. per kW.

De-aeration for avoiding oxygen corrosion of the internal boiler surfaces increased in importance with rising pressures. It was accomplished by a sudden increase in temperature or decrease in pressure which promoted the release of non-condensable gases, which were continuously removed by air pumps, in either the condenser, a flash de-aerator or a feed heating de-aerator. Adequate head on feed-heating de-aerator extraction pumps was required to prevent their becoming vapour bound if the bled-steam pressure fell sharply due to loss of load.

Distilled make-up water, amounting to about 2½ per cent. for base load plant and up to 10 per cent. for peak-load plant, could be obtained from single-effect bled-steam evaporators, operating on the pressure and temperature difference across two adjacent tapping points on the turbine or, with but slight loss of efficiency, from independent high-pressure multiple-effect evaporators incorporating vapour recompression.

Feed-Water Treatment

Chemical treatment varied with make up, but a common sequence was pre-softening of the raw water followed by distillation and the addition of caustic soda and sodium sulphate at the feed-pump suctions to prevent acid corrosion of feed lines and economiser and caustic embrittlement in the boiler. A reserve of tri-sodium phosphate in the boiler drum, maintained by intermittent injection, prevented scaling due to temporary variation in hardness of the feed. Continuous blow down was increasingly used in order to maintain a uniform and low concentration of dissolved solids.

Development of turbo-alternators of increased capacity at 3,000 RPM was mainly a problem of design of the rotors, which were machined from single solid-steel forgings. At 1,500 RPM the largest rotors might be built up of three forgings or of a forged shaft with shrunk-on or welded steel discs.

The high thermal conductivity and specific heat of hydrogen made it an effective coolant and its low density reduced windage loss. As compared with air cooling the total losses were reduced by some 40 per cent. and the output was increased by 25 per cent.

Elaborate sealing was necessary to prevent leakage of hydrogen where the revolving shaft emerged, together with CO_2 scavenging prior to filling or emptying the machine, and the entire casing of the machine had to withstand the maximum explosive pressure of about 100 lb. per sq. in.

High-Voltage Switchgear

THE fourth lecture was given on April 5th by Mr. C. W. Marshall, who dealt with control of high-voltage power circuits. He referred first to the great variety of busbar systems that had been evolved to suit local requirements. These variations included single or double busbars, sectionalised with or without coupling reactors in linear and ring form, and the mesh arrangement of switchgear, which discarded the busbar in the accepted sense, as well as differences in methods of bus selection and in the use of duplicate circuit-breakers. Since interconnected working of networks was becoming standard practice, major economies could be effected by simplifying individual arrangements, any duplication necessary being carried out in different stations rather than within a particular station.

At present, the limiting economic voltage for metalclad gear appeared to be 66 kV, but even at this, and certainly at higher voltages, open-type switchgear had established ascendancy, while at lower voltages open-type switchgear had frequently to be used now because of shortage of materials.

Much of the great reliability of the circuit-breaker was due to work done in short-circuit testing stations during the past twelve years. Large-oil-volume circuit-breakers had been displaced by the small-oil-volume type, fitted with arc-control devices, and the latter was in turn being assailed by the air-blast breaker for high voltages and by the air-break type for lower voltages, resulting in the reduction, if not elimination, of fire and explosion risk, increased rapidity of fault clearance and increased efficacy of auto-reclosing.

Protective Methods

Discriminative protective equipment based on the Merz-Price system had maintained its position wherever pilot wires could be economically provided, but distance protective systems based on the impedance and reactance principles now approached it in speed of action, sensitivity and stability. There was, nevertheless, a tendency towards general adoption of interlocking systems, using the power lines themselves as pilots, and high-frequency currents as the signalling medium. Carrier currents were also being developed for telecommunication and other purposes as subsidiaries to discriminative protection.

Service failures due to slow deterioration of insulation could be forestalled. Porcelain

line insulators and post insulators were readily tested by determining the voltage distribution on the units. Fibrous-insulation deterioration was more difficult to diagnose, but measurements of insulation resistance, capacity current and dielectric loss helped to indicate any deterioration, such as that which was caused by ionisation in voids and by tracking.

Voltage control by on-load ratio-changing of transformers had become established, largely due to its adoption on the grid transformers, and continuous and smooth voltage regulation could be provided by moving-coil regulators.

Owing to frequency control the synchronous electric clock had become a recognised substandard of time-keeping. Continuous indication of outputs of distant power stations, loads on interconnectors and the like, was now practicable and instrument readings could be transmitted accurately over pilot channels with any reasonable technical characteristics.

Grid Operation

Position of Secondary Stations Discussed

THE status and purpose of secondary generating stations in connection with the grid have been reviewed in a paper by Mr. R. A. W. Connor (see last week's issue, p. 463) at the Institution of Electrical Engineers in London.

Mr. J. D. Peattie (Central Electricity Board) opened the discussion on the paper on April 1st with the remark that while the author had focused attention on the effect of differences in thermal efficiency on operating arrangements and classification of stations, in practice the effect of differences in coal prices was much more serious. Therefore, in order to keep the total cost of generation to the minimum, it was necessary, when planning extensions, to balance the saving in cost of fuel against the extra cost of measures required to increase efficiency. Economy measures, which were not worth while ten years ago, might be very much worth while at the present time. Table 3 in the paper might be typical of a class " B " or secondary station at the present time, but the writing was already on the wall so far as stations of this kind were concerned.

Results at New Station

A new British station had come into operation which had changed the position. Starting off with 650 lb. per sq. in. pressure and appropriate intermediate figures, it had during the last year operated as a secondary station, shut down at nights and week-ends, the running hours being 6,435, and it recorded an overall efficiency of over 25 per cent. and an efficiency ratio of about 57 per cent.

There had been more progress in utilising the available energy, once the steam cycle had been chosen, than there had been in increasing the energy itself by the use of higher temperatures and pressures.

The efficiency of the secondary stations under wartime conditions showed a slight decline, but there was reason to believe that the trend now was well on the upward grade again in spite of the unsuitable and non-uniform quality of coal. The attainment of overall economy was the result of team work on the part of all stations, not merely due to the high performance of the base load stations.

Mr. C. W. Priest (Fulham) said that on the day before the meeting his secondary station, running for 8 hours, experienced three distinct peaks varying from 100 down to 20 per cent.; it was impossible to do a great deal as regards efficiency under such conditions. The principal function of the secondary station was to guard against the maximum demand, not to generate kWh; under those conditions it was almost impossible to install new equipment, so the attempt was made to carry on with the minimum amount of instruments and equipment. There seemed to be half a dozen different methods of working out the true steam cycle efficiency with multi-stage bleeding.

Keeping Staffs Interested

It was difficult to find suitable occupation for skilled staff during exceptional periods of shut down. Turbine drivers did not take very kindly to work usually given to cleaners and labourers and were therefore apt to become discontented. Accordingly, steps must be taken to keep the staff in secondary stations interested in their job and in maintaining efficiency. He disagreed with the author's views with regard to fuel consumption and maintained that the no-load loss for the station must be considerably in excess of the very low figure suggested by the author.

Mr. J. N. Waite (Central Electricity Board) suggested that the previous speaker had fallen into an error; although it seemed paradoxical, it was a fact that the higher the efficiency of the turbine the higher would be the no-load steam consumption as a percentage of the full-load steam consumption.

The object of the loading control engineer was to secure the lowest overall fuel cost for all stations, not merely to operate the most efficient plant. Base load stations were not run continuously at full load. Thus they had to meet, in a different degree, the problems of the secondary station operators. Many operators lumped into the banking load figures items which did not belong there, so having an important effect on the final figures. For instance, several tons of coal were left on the grates when shutting down and several tons were still on the grates in the morning which were used for generating kWh, yet they were included in standby losses. The cutting down of the banking losses was easier with pulverised fuel, which was deservedly receiving a great deal of attention. There were one or two stations which were finding it possible to shut down at night and burn practically no coal until they started up again in the morning, but that could only be done by really airtight dampers and airtight boiler casings. He considered that a still further rise in efficiency could be obtained and it would have to come from the Class B stations.

Fewer and Larger Stations

Mr. W. S. Burge (Central Electricity Board) believed that in the not distant future there would be more scope for longer hours throughout the whole of the year for big stations to run on higher outputs, and there was distinct evidence that the diversity in terms of fuel cost per kWh of stations throughout the country had been decreasing; the best stations in the country were getting ever closer, which was of special significance in secondary station operation. He was inclined to think that as time went on there would be fewer stations in relation to the load to be dealt with, such stations being of larger capacity. Bulking these three things together, one important consideration emerged. He was very much inclined to think that in the not too distant future they would be faced with the necessity for base load stations having to deal with a much more flexible form of loading and, to a quite considerable extent, shutting down.

Mr. B. Wood (Merz & McLellan) suggested that the load duration curve set out in the paper was a type which had been neglected for many years but, on the other hand, it was a dangerous curve, in that it could be used for incorrect purposes. It could not be used generally with safety and the only satisfactory way of finding out what was going on, and when, was by an analysis of the daily load curve. It was safer not to base calculations on the duration curve. On the question of the regulation of control, the author was right in saying that it was undesirable to try to raise the load when the boiler pressure was dropping. That remark also applied to frequency. Would it not be worth while to think of two radical alterations in methods in this connection? For instance, the ability of water power stations designed as peak load stations to pick up loads and to drop them at will was very marked. The same applied to Diesel plant and gas turbine plant. Another radical change would be to start working boilers on the once through principle, which had already been done in Germany although it meant one boiler one turbine.

Mr. L. M. Jockel suggested that great care should be taken that load factor did not become a fetish, particularly in secondary stations. He knew of a secondary station generating between 100 and 200 million kWh per annum which had its ordinary load factor decreased from 43 to about 21 per cent. in three years, and yet the thermo-dynamic efficiency of the station did not appreciably drop. The training of personnel in electricity supply stations would have to be dealt with at an early opportunity, and the author's views on the matter were excellent. He also suggested quarterly meetings between the engineers of secondary and primary stations.

The figure of 90 per cent. for turbine availability did not apply on the average, the figure being between 85 and 90 per cent. On the other hand he considered the author's availability ratio of 70 per cent. for boilers was too low; it should be from 80 to 85 per cent. With regard to maintenance costs, he urged the C.E.B. to give a lead and get out a standardised method of costing and, if necessary, abandon the pence per kW-hour basis.

Mr. G. J. Maughfling, commenting on Mr. Wood's suggestion, said that one water power station here required at least five hours warning before it could undertake any considerable variation of load. Mr. Wood replied that he had in mind a case in Germany in which a very large variation of load was accepted in three minutes, the station being 250 miles away.

Author's Reply

The author replied to some of the points raised and said most of the paper was written before the war and, of course, some of the later results could not be foreseen. When conditions were normal again he believed development would be along the lines he had indicated. The psychological effect upon the staff of poor loading was serious. He agreed that if load factor increased in the future, there would be considerable scope for increasing efficiency in the secondary stations.

The paper did not deal with maintenance problems, but he agreed that plant which was running for 24 hours called for special consideration. He also agreed that any attempt to co-relate load factor and thermal efficiency should be strongly deprecated.

Hospital Installations

Many Special Considerations

THERE are just over 1,500 hospitals in Great Britain and Ireland, excluding mental hospitals, nursing homes, out-patient and special clinics, and convalescent homes. Guidance in respect of the layout of electrical installations in such premises, with special emphasis upon considerations that differ from those applicable to other large public buildings, is afforded in a paper prepared for the Installations Section of the Institution of Electrical Engineers by Mr. F. C. Raphael.

Stand-by lighting is not compulsory by regulation, although some local authorities in some cases call for a separate source of illumination for fire-escape stairs and exit doors from wards. Emergency lighting in operating theatres is deemed desirable; it usually consists of an automatic low-voltage battery system. The best arrangement is for all emergency lamps in all wards, operating theatres and casualty rooms to be separately wired, power being provided by a self-starting generating set driven by a heavy-oil engine.

Screwed Conduit Preferred

Paper-insulated and lead-covered cable is recommended for permanent circuits to fuse-boards. The author maintains that sunk screwed conduit is still the best for all sub-circuit wiring. Methods of sinking the conduit are briefly discussed; under-floor ducts are not favoured. In making suggestions regarding the selection of accessories and fittings the author remarks that many hospital installations are spoilt by the use of common types of switches; the three essentials are ease of cleaning and replacement, with good appearance. Tilting mercury tube (sparkless) switches designed by the author for use in operating theatres interlock with plugs of the standard three-pin gauge, so that appliances used elsewhere can be connected to them, but ordinary plug tops cannot be inserted. Standard flush socket outlets are recommended in wards; switch control is usually preferred, but interlocking is only necessary in children's wards.

A comparatively low value of horizontal illumination is recommended generally in wards, with local lighting at the beds. Capacitance dimming of lamps over patients' beds is described for AC circuits. The author has always preferred double-filament lamps on DC systems rather than resistance dimming for local lights, and series parallel switching for general ward dimming. Probable future uses of fluorescent lamps are mentioned, a shadowless lamp for operating-table lighting is described and reference is made to precautions that must be taken against explosions in operating theatres.

Wartime requirements for the screening of high-frequency diathermy apparatus are reviewed, the opinion being expressed that these regulations will be continued after the war. Precautions that should necessarily be taken in the construction and use of electric therapy apparatus are outlined, while cable shielding and voltage drop are discussed in respect of X-ray developments.

Mr. Raphael thinks that the mercury vapour discharge lamp, possibly supplemented by ordinary tungsten filament lamps, should eventually displace the more expensive arc lamp for ultra-violet ray treatment. He considers that there is no need to attempt artificial reproduction of sunlight.

Cardiograph Wiring

There is advice on cardiograph wiring, for which three-core circular lead-covered cable is usually sufficiently free from disturbance by external currents if it is run at a reasonable distance from power and lighting circuits, but some recent practice has called for a fourth conductor. Cardiographs can be interfered with inductively by faults on the electric power distribution network occurring more than half a mile distant from the hospital.

If sufficiently low tariffs can be arranged the use of electricity for both space warming and water heating in hospitals should be considered. The wiring for, and switching of, ventilating fans and water pumps are discussed. The limited amount of electric cooking in hospitals has disappointed the author, who remarks that sisters and nurses are trained in gas cooker technique. He thinks there might often be a good case for the installation of a small electric refrigerator (preferably motorless pattern) in each ward instead of the large central plant usually specified by the architect. Signalling circuits in large hospitals can become very elaborate.

Agriculture and the Nation

UNDER this title an interim report on post-war food production policy has been published by the National Farmers' Union, 43, Bedford Square, W.C.1 (price 1s.). In this there is much of vital importance to the country's future but we are unable to deal with it from the general point of view. All that can be said here is that the report again stresses the need for better conditions in rural areas, including the availability of electricity, if workers are to be attracted to the land.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE new president of the Electrical Power Engineers' Association, **Mr. E. Laming,** has been a member of the Association practically since its inception and has been active in its affairs for many years.

Mr. E. Laming

Mr. Laming, who is a Yorkshireman, served his apprenticeship with the Sheffield Corporation and subsequently held positions at Chesterfield, Blackburn, Rotherham and Rochdale. He then became charge engineer with John Brown's of Sheffield and later was appointed to a similar position with Lever Bros., Port Sunlight.

In 1928 he took up the position of charge engineer at the Greenwich power station of the London Passenger Transport Board and still holds that post.

Mr. S. Gough is president-elect of the E.P.E.A. and **Messrs. R. B. Carr** and **G. E. Moore** vice-presidents.

Lord Ashfield has been appointed a director of Short Bros. (Rochester & Bedford), Ltd., which has been taken over by the Ministry of Aircraft Production. He is chairman of the London Passenger Transport Board and the Northmet Power Co. and a director of a number of other companies.

Mr. A. E. Iliffe (Benjamin Electric, Ltd.) has been re-elected chairman of the Electric Light Fittings Association for the fifth successive year. **Mr. Felix A. Rogers,** the secretary, has been given the title of director and secretary.

Mr. C. Heathcock, F.C.I.S., managing director of the Midland Electric Corporation for Power Distribution, Ltd., was elected chairman of the West Midlands Joint Electricity Authority at the recent triennial meeting, in succession to **Alderman J. Cliff Tibbits,** J.P., who has been chairman for the past three years.

Mr. C. Heathcock

Mr. Heathcock commenced his career as junior clerk with the Midland Electric Corporation in 1903 and has held the successive appointments of chief accountant, secretary, general manager, and managing director. He has made a special study of the economics of electricity supply. For a number of years he was secretary of the District Joint Industrial Council for the Electricity Supply Industry and is still a member of the Council. He was also secretary for the District Joint Board of Employers and Members of Staff.

He was a member of the committee which investigated the possibilities of setting up the J.E.A. and among those recommending its formation, and he has been a member of the Authority since its inception in 1926, having been vice-chairman for the past three years. Mr. Heathcock has been a member of the London Council of the Chartered Institute of Secretaries for twenty years.

Councillor Dyehouse, chairman of the Electricity Committee of the West Bromwich Town Council, has been elected vice-chairman of the Authority.

The North West Midlands Joint Electricity Authority has elected **Alderman H. Leason,** J.P., A.M.I.E.E., to be chairman for the next three years. He has previously held the office of chairman of the Technical Operating Committee of the Authority and chairman of the Electricity Committee of the City of Stoke-on-Trent.

At the Penistone Works of David Brown & Sons (Huddersfield), Ltd., on March 30th, Mr. David Brown, the managing director, presented to **Mr. F. W. Rowe** a cheque for £500 on his relinquishing the position of general manager

Mr. David Brown making the presentation to Mr. F. W. Rowe

of the works to become managing director of Kryn and Lahy (1928), Ltd. Mr. Rowe has been with the David Brown organisation for nearly twenty years.

Mr. F. W. Cripps (general manager) and **Mr. A. J. Gunn** (works manager) have been appointed directors of the Dowsing Company (Electrical Manufacturers), Ltd.

Mr. J. J. Kelly has retired on pension from the service of Siemens Electric Lamps & Supplies, Ltd., on account of ill-health. Mr. Kelly served his apprenticeship with the Great Northern Railway of Ireland and then went as a pupil to the Great Northern & City Railway, one of the early London tube systems, later becoming power house superintendent. He

joined Siemens in 1913 as a traction lighting specialist and his early work was connected with the conversion of the lighting of railway and tramway stock from carbon-filament to "Tantalum" and later to the tungsten-filament lamps specially developed by Siemens for traction purposes.

The Municipality of Bulawayo, Southern Rhodesia, has appointed **Mr. R. H. Redman,** B.Sc.(Eng.), A.M.I.E.E., A.M.(S.A.)I.E.E., as distribution engineer. Mr. Redman was formerly with the Folkestone Electricity Supply Co., Ltd., and has lately been with the Electricity Department, Salisbury, Southern Rhodesia. The Bulawayo station had a peak load for the year ended June 30th, of 15,100 kVA, and the electricity generated was 69 million kWh. The total capacity of the present station is 28,500 kW, and plans are being made for a new 120,000 kW station. Transmission is carried out in this area at voltages of 11 and 22 kV, and 66 and 33 kV to the outside districts administered by the Electricity Supply Commission. The Meter and Electrical Department is being expanded and a new modern test room is in course of construction.

Mr. R. H. Redman

Mr. P. B. Price, who, as reported last week, has retired from the position of works manager of Burco, Ltd., was presented by the directors and employees of the company on March 31st with a grandmother clock, a cut-glass vase and a silver rose bowl. Mr. J. Stancombe, machine foreman, and Mr. H. Buckley (chairman), made the presentations. Mr. Ward, managing director, paid a tribute to Mr. Price for his long service with the company.

Mr. H. G. Brown, chief engineer, and **Mr. J. Nadin,** general manager, of the D.P. Battery Co., Ltd., have been appointed to the board of the company.

The directors of A. C. Cossor, Ltd., have announced that **Sir Louis Sterling** has ceased to be a director of the company, and they have appointed **Mr. T. A. Macauley** as chairman of the board. **Mr. J. H. Williams,** formerly managing director of the Marconiphone Co. and also Radio Controller for H.M.V. and Marconiphone and past chairman of the Radio Manufacturers' Association, and **Mr. J. W. Horton,** formerly managing director of Pathe-Marconi, Paris, have been appointed joint general managers together with **Mr. V. A. Robins,** for many years general works manager of A. C. Cossor, Ltd. As we have already reported, the company is in negotiation with the principals of another radio company with a view to merging their interests, and the board has authorised Mr. Macauley to proceed with the conversations.

Sir Louis Sterling

Mr. C. A. Nelson, managing director of Hartley Main Collieries, Ltd., and a well-known mining engineer who has supervised the electrification of many collieries in Northumberland and Durham, has retired. During the slump years Hartley Main Collieries were electrified and about 90 per cent. of the coal is now won mechanically.

Obituary

Sir Horace Boot.—The death occurred on March 31st, at the age of 70, of Sir Horace Boot, M.Inst.C.E., M.I.Mech.E., M.I.E.E., who will be remembered by the older generation for his work with the Tunbridge Wells electricity undertaking, where he was borough electrical engineer in the late 'nineties. Sir Horace served his time in the shops of the United Electrical Engineering Co., and Johnson & Phillips, and later was assistant engineer and draughtsman to Laurence, Scott & Co. (now Laurence Scott & Electromotors, Ltd.), in which position he assisted in the designing of the Norwich electricity works, laying the mains and erecting the plant. Later he became sub-manager of the Gülcher Electric Light & Power Co. at Battersea Foundry when that company was undertaking the lighting of several large towns in New Zealand. He also became senior demonstrator in electrical engineering at the Battersea Polytechnic.

The late Sir Horace Boot

Sir Horace relinquished these appointments in order to superintend the installation of several large plants for the Government and the Post Office in Ireland. He became borough electrical engineer of Tunbridge Wells in 1895, and in the following year was appointed consulting engineer to the Corporation. He also acted as consulting engineer to a number of other Corporations. He resigned his position o resident engineer at Tunbridge Wells in 1907, in order to devote more time to his consulting practice. He founded Horace Boot & Partners, Ltd., consulting engineers, and later also became associated with the Eastwood Group of brick and cement companies, of which he was chairman at the time of his death.

Mr. George Wall, head of the Meter Design Section of the Metropolitan-Vickers Electrical Co., Ltd., whose death on March 20th we briefly announced in our last issue, was educated at Owens College, Manchester, the Royal College of Science, London, and the Central Technical College, South Kensington. He held the degree of M.Sc. (Manchester) and was an associate of the Royal College of Science. He became a Whitworth Exhibitioner in 1896 and a Whitworth Scholar in 1899. Mr. Wall commenced his career in the electrical industry in 1901 with Ferranti, Ltd., as experimental electrical engineer, and later became chief

electrical research engineer. In 1923 he left that company to join Metropolitan-Vickers as electrical instrument and meter engineer, subsequently becoming head of the Meter Design Section, which position he held for many years prior to his death. He leaves a widow and a son.

Mr. R. V. Weare.—We regret to record the death of Mr. Reginald Vivian Weare, A.M.I.E.E. city electrical engineer of Chichester, which occurred on April 2nd, after a long illness; he was sixty-one years of age. Mr. Weare was educated at Southdown College, Eastbourne, the County School, Wellington, Somerset, and Faraday House, with periods at Robert Stephenson's Engine Works, Newcastle-on-Tyne, and Southampton Corporation electricity works. In 1900 he was appointed electrical assistant at the Crawford-Voelker Laboratories, London, and in the following year became shift engineer with the Bournemouth & Poole Electricity Supply Co. After serving as shift engineer at the Bournemouth tramway generating station and with the Ilford U.D.C. and the Brompton & Kensington Co., he became charge engineer at Willesden with the North Metropolitan Co.

Mr. Weare was appointed in 1908 as resident engineer to the Chichester Electric Light & Power Co., Ltd., and when the undertaking was acquired by the City Council in 1923 he was appointed city electrical engineer.

Mr. C. R. Shaw.—We regret to report the death, which occurred on March 26th, of Mr. Cecil Rumsey Shaw, A.M.I.E.E., at the age of sixty-four. Mr. Shaw was educated at the Central Technical College and was the joint founder (with his brother, Mr. J. G. Shaw) of the Crypto Electrical Co. in 1904. After many years' close association with the Lancashire Dynamo & Motor Co., Ltd., the two companies finally amalgamated in 1932 under the title of Lancashire Dynamo & Crypto, Ltd., and Mr. Shaw was a director up to the time of his death.

After the retirement of his brother from active management, Mr. Shaw continued to devote his whole energies to the control of the rapidly expanding Willesden factory of the company, and it was not until just before the outbreak of the present war that he himself relinquished active control and went into retirement.

Mr. John Campbell Murray, the well-known Scottish consulting engineer, died on March 30th at his home, Whitecraigs, Renfrewshire. Mr. Murray, who carried on business in Wellington Street, Glasgow, was responsible for the electrical work in the Empire Exhibition held in Bellahouston Park, Glasgow, in 1938. He was a member of the I.E.E. and was actively associated with the Scottish Centre of the Institution.

Mr. E. A. Airey.—The death occurred on March 31st at the age of forty-two of Mr. E. A. Airey, for fourteen years district development officer of the Horley & District Electricity Supply Co., Ltd.

Mr. R. W. Paul.—The funeral of Mr. R. W. Paul, whose death we reported last week, took place at Putney Vale Cemetery on April 3rd. In addition to members of the family there were present Sir Frank Smith, G.C.B., Captain Barker, and Messrs. J. D. Adams, G. M. Harris, C. Hepworth and Eustace Thomas. The Royal Institution was represented by Dr. W. H. Eccles, Professor Rankine and Captain T. Martin; the Institution of Electrical Engineers by Dr. C. V. Drysdale; the Physical Society by Sir Charles Darwin, Professor W. Jevons and Mr. J. H. Awbery; the Institute of Physics by Mr. R. S. Whipple; the *Journal of Scientific Instruments* by Dr. H. R. Lang; the Cambridge Instrument Co. by Messrs. Apthorpe and Wakeham; and the British Kinematograph Society by Mr. P. H. Bastie.

Forthcoming Events

Institution of Electrical Engineers.—Monday, April 19th, 5.30 p.m. Informal discussion on "Infra-red Lamp Heating and its Application to Industrial Purposes," to be opened by Mr. F. E. Rowland.

Transmission Section.—Wednesday, April 14th, 5.30 p.m. Paper: "The High-pressure Gas-filled Cable," by Messrs. C. J. Beaver and E. L. Davey.

Measurements Section.—Friday, April 16th, 12.30 for 1 p.m. Connaught Rooms, W.C.2. Informal luncheon. 3 p.m. (at I.E.E.). Paper: "The Control, Specialised Testing and Use of Some Modern Insulating Materials," by Mr. A. R. Dunton.

North-Eastern Centre.—Monday, April 12th, 6.15 p.m. Royal Station Hotel, Newcastle-on-Tyne. Annual meeting and conversazione.

North Midland Centre.—Saturday, April 17th, 2.30 p.m. Leeds. Annual meeting.

North Midland Students' Section.—Saturday, April 10th, 2.30 p.m. Griffin Hotel, Leeds. Paper: "Static Electricity," by Mr. R. Oliver, B.Sc.

South Midland Students' Section.—Thursday, April 15th, 7 p.m. English Electric Association Hall, Stafford. Paper: "The Construction of Overhead Lines in Rural England," by Mr. W. E. Darby.

Scottish Centre.—Wednesday, April 14th, 6 p.m. Heriot-Watt College, Edinburgh. Annual meeting followed by paper on "Standardisation of Distribution in Densely Loaded Areas," by Mr. J. W. Leach.

North-Western Centre.—Saturday, April 17th, 2.30 p.m. Engineers' Club, Manchester. Paper: "Air-blast Circuit-breakers," by Mr. A. R. Blandford.

Birmingham Electric Club.—Monday, April 12th, 6 p.m., Grand Hotel. "Brains Trust": Question Master, Mr. J. W. Donovan, B.Sc., A.M.I.E.E., president.

Illuminating Engineering Society.—Tuesday, April 13th, 5 p.m. Lighting Service Bureau, 2, Savoy Hill, W.C.2. Paper: "Photo-electric Photometers: their Characteristics, Use and Maintenance," by Mr. J. S. Preston.

Junior Institution of Engineers.—Saturday, April 17th, 1 for 1.30 p.m. Connaught Rooms, London, W.C.2. Annual luncheon.

Association of Mining Electrical and Mechanical Engineers.—*South Wales Branch.*—Saturday, April 17th. Cardiff. Talk on "Steel Foundry Practice," by Mr. R. J. Richardson.

Royal Society of Arts.—Wednesday, April 14th, 1.45 p.m. Institution of Electrical Engineers, Savoy Place, Victoria Embankment, W.C.2. Trueman Wood lecture on "Science in Soviet Russia," by Mr. J. G. Crowther.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Recommissioning Plant

I HAVE followed the correspondence on this subject with particular interest as I am associated with the compilation of a register published for the specific purpose in question.

As Mr. Heywood states in his letter in your issue of March 26th, the main difficulty is to get firms who have idle plant to disclose this fact, especially in the case of firms who make very few plant re-arrangements and consequently have only odd items of equipment for disposal, at infrequent intervals. Some of the items may be major pieces of equipment, but even then some firms do not seem to bother about disposing of the plant and putting the capital thus tied up to a more useful purpose.

Apart from some national appeal through the Press, or the compulsory registration of idle electrical plant, as was done in the case of machine tools, I cannot see how these firms can be reached, and if dealt with in the latter manner a multiplicity of regional offices with their attendant staff would no doubt be required to compile a register, which in a private firm could possibly be dealt with by an individual.

The National Stock List is at present practically useless for this purpose as only about 2½ per cent. of its pages are devoted to electrical plant, and practically only a few odd miscellaneous items are listed, so there is very little point in firms endeavouring to use it as a medium either for obtaining their requirements or for disposing of spare equipment.

Any firms who have plant available and do not wish to deal with its disposal themselves, however, can easily put the matter in the hands of their electrical contractors who can dispose of the plant for them through any of the journals or registers published for this purpose, but the owners must by some means be made to realise that present circumstances necessitate all idle plant being disclosed so that it can be put to a useful purpose.

" ELECTRICAL SURPLUS."

Leeds. (R. F. WINDER, LTD.)

IT is curious how far both Mr. Lawton and Mr. Holding construe from my letters in your issues of February 5th and March March 17th that I advocate action by a Government Department in this matter. I consider it of national importance that owners of unemployed electrical plant should be called upon to give notice of its existence, and that a Government Department is best equipped to provide the organisation for the registration and zoning of such plant. Beyond this I agree that the disposal of the plant is best left to specialist firms.

Mr. Holding's suggestion that the Government should license a few such firms to purchase redundant plant from private sources is in my view rather dangerous, as it would bring about monopoly and unfair interference with private trading. It would be fairer to license all resellers and permit no movement of registered plant except for legitimate re-employment within the framework of the B.O.T. licensing regulations and through the medium of licensed resellers.

The National Stock List could be a valuable organ having a proper liaison with the Mutual Aid Scheme of the Ministry of Supply. At present this scheme appears to be local and of limited utility. A central register such as is afforded by a National Stock List should amply justify the cost of preparing and maintaining it. I should imagine that the Directorate of Industrial Electrical Equipment would welcome such a register to simplify its procedure with inquiries for electrical plant where new plant may not be used on grounds of limitation of supply.

I have been greatly interested by the views of those readers already mentioned and of Mr. H. H. Heywood, and thank you for your courtesy in this matter.

Wembley. E. H. CROOK.

War-time Soldering

WITH reference to recent articles and correspondence in the *Electrical Review* on soldering in wartime, the advantages of using a soldering iron supplied from the tapped low-voltage secondary of a small transformer are confirmed by our experience. Some two and a half years ago the need was greatly felt here for a small pencil-type iron capable of being used satisfactorily for very light soldering work of a continuous nature. The smallest standard iron in the market at that time with a loading around 60 W being far too heavy for the delicate work carried out, it was decided to develop a suitable iron to operate at a low voltage on account of the high resistance which would have to be accommodated in a small space if standard voltage were used. The iron eventually produced had an overall length of 8½ in. including the handle, a weight of 3½ oz. and a loading of 25 W at 10 V. It proved successful and its use was extended to light soldering work other than that originally considered.

The varying work now being tackled raised the question of control of the bit temperature and, since a transformer was necessary to produce the low-voltage supply, the obvious method of control was by means of tappings on the secondary. Hundreds of these irons are now in use in this factory. In many cases one transformer supplies fifteen or twenty irons on one bench, each operator being provided with a series of plug points giving one-volt steps between 8 and 12 V, so that the loading can be varied between 16 and 36 W.

It is found that a loading of 25 W corresponds, with the normal design, to a bit temperature of about 290 deg. C. and 30 W to a bit temperature of 360 deg. C. These temperatures were measured with the iron idle and, obviously, fluctuate when soldering, depending upon the type of work, but they satisfactorily cover all our light soldering operations using the new standard solders. A loading of 16 W is too low for the new solders, but it still provides a useful stand-by heat while the iron is idle.

We have found this method of control to be most satisfactory, and can also confirm the other advantages mentioned by your contributors, namely, a robust resistor, safety in handling, and, in the case of the iron described above, lightness, the last two points being particularly welcomed by the operators, most of whom are women. The absence of an earth wire also obviates the necessity for three-core flexible, an important item now.

Trafford Park, Manchester. METROPOLITAN-VICKERS ELECTRICAL CO., LTD.
E. E. Walker.

Engineering Economics

ALL branches of the electrical industry will be keenly interested in your review of Sir Frank Gill's paper dealing with the above subject. At the outset, I would suggest co-operative study between the technical and the commercial staffs in this new enterprise.

It will be imperative for this country to increase its export trade in post-war years. Our present loss in "invisible" exports will require a great effort in order to redress the adverse trade balance.

The greatest danger may be inflation. The limitation and rationing of supplies will be necessary; hence the need for economy in design and manufacture. It is vital, therefore, that the subject of engineering economics should be available to all in the industry irrespective of their ordinary actual duties. It is apparent that the commercial staffs of electrical concerns require technical knowledge to perform their work satisfactorily. This appears to be a favourable opportunity to present a truly comprehensive scheme.

Bromley. H. G. CLAYTON, F.C.I.S.

Registered Electrical Contractors

THE report of the Executive Committee of the National Register of Electrical Installation Contractors for the past year, which was presented at the annual meeting on Tuesday last, shows a small decrease in income. This was due to the facts that fewer new certificates were issued and fewer registered contractors applied for the renewal of their certificates. On the other hand, there was also a substantial decrease in expenditure, so that there was a surplus of income over expenditure of £513, as compared with a deficit of £277 in the preceding year.

Applications for registration during the year numbered 19; of these 15 were accepted, one was declined and three remained under investigation at the close of the year. The net number on the Register at December 31st last was 1,360, a decrease of 51 during the year. An analysis of cancelled registrations shows that 26 were due to death or closing down of business; 21 to war conditions; 18 to change of ownership; and five to failure to renew certificates (no reason given). Since the close of the year three more contractors have been added to the Register.

During 1942 the Register's inspectors paid 238 visits and inspected about 400 installations of all descriptions. In 46 cases the work was found to be satisfactory; faults were disclosed in 106 instances; no inspection was possible owing to war conditions in 66 cases; and 20 inspections were of work of new applicants. From examination of 108 inspection reports the following types of fault were disclosed:—High-resistance earth continuity path of conduit; no tests made for earth continuity and no suitable apparatus for making such tests; no lug or clamp at main earthing connection; main earth lead too small; main earthing not readily accessible; metal not earthed at all or inadequately earthed; bushes missing from ends of conduit; cotton-covered flex used in kitchens, sculleries and bathrooms; unprotected v.i.r. cable in exposed positions and less than 6 ft. from floor level; metal outlets not used at switch positions on conduit systems; holes for t.r.s. cable not made good; wrong switch polarity; switches within reach of baths; and t.r.s. cables and conduits touching gaspipes.

Compulsory Registration

At the meeting Mr. J. D. Spark asked whether, in view of the comparatively small number of contractors on the Register, any active steps were being taken towards making registration compulsory. The chairman (Mr. P. V. Hunter) replied that the Register had no authority to do this and until some action was taken by the nominating bodies, the individual views of which were conflicting, it was difficult to make any move in the matter.

Mr. F. W. Purse said that it was no use having compulsory registration of firms without also having registration of operatives, with compulsory standards of installation work and materials.

Mr. L. C. Penwill considered that there was a case for the Register to refer the matter back to its constituents.

All the retiring officers were re-elected.

COMMERCE and INDUSTRY

Heating Installation Order. Call-up Arrangements.

Central Heating Ban

BETWEEN April 17th and October 31st in England and Wales and between May 8th and October 31st in Scotland the use of fuel for the central heating of shops, offices, flats and other non-industrial premises is prohibited, save under written permit, by a Direction made by the Minister of Fuel and Power, under the Control of Fuel (No. 3) Order, 1942. There are relaxations of the Order in respect of installations which are used to supply hot water as well as heating and a number of classes of premises are exempt, including hospitals, schools and wartime nurseries.

Export Control

Telegraph and telephone apparatus and distributor caps and rotors are among the classes of goods covered by the Export of Goods (Control) (No. 4) Order, 1943 (S.R. & O. 1943, No. 455, Stationery Office, 1d.). In future licences will be required for the exportation of these goods.

The existing licensing requirements relating to flowmeters containing mercury are superseded by the provision that in future licences will be required for the exportation of flowmeters; and indicating, registering and recording units, venturi tubes, pitot tubes and orifices therefor, wholly or mainly of metal.

Telephone instrument and switchboard cords, whether or not fitted with plugs, tags or similar attachments, have been transferred from Group 6 (3) to Group 12 (2) of the Schedule of Controlled Goods.

Deferment of Call-up

The Ministry of Labour and National Service announces that the arrangements for the calling up of men of military age from the building and civil engineering industries which were notified to employers in December last are to continue with certain modifications. But, in order to retain for the time being in these industries a proportion of the younger and mobile men for the completion of urgent Government work, arrangements have been made to reduce the number of men to be released during the quarter ending June 30th. At the same time men below the military standard of fitness or above military age (but not over 51) will be considered for transfer to local vital industries, mainly munitions industries, to release other men for the Services.

For certain classes the call-up is suspended until after June 30th, but no electrical grades are included. Applications for men in other occupations marked "SS" (special schemes) in the Schedule of Reserved Occupations cannot be granted generally, but it is stated that individual deferment may be granted for short periods in certain exceptional cases. These include general foremen and men engaged by contractors in maintenance work on railways and public utilities; and working principals or foremen engaged on urgent Government or other priority contracts.

As regards men in the building and civil engineering industries not marked "SS" in the Schedule, deferment may be granted in suitable cases until the end of June. In certain occupations deferment will be granted to all men employed upon Works and Buildings "A" contracts and no application need be made if current deferments are in operation. A renewal application should be made in the usual way three weeks before the period expires. Occupations in this class include cable jointer, repairer; cable jointer (excluding high tension but including telephone and telegraph cables); electrician, wireman; and fitter, mechanic and maintenance engineer, engaged on the repair and maintenance of contractors' plant. In these cases applications will be considered for men of any age. Applications for electricians' mates aged 25 or over employed on W.B.A. contracts will also be considered.

These arrangements do not apply to men in building and civil engineering occupations directly employed by local authorities and public utilities on other work (*e.g.*, on ordinary maintenance of public utilities) to whom the usual arrangements regarding deferment apply.

Full details of the arrangements are given in leaflet N.S.264 obtainable from Employment Exchanges.

Glasgow Annual Contracts

The Glasgow Corporation Electricity Sub-Committee on Finance and Works, after hearing a report by the manager regarding the question of inviting offers for the supply of meters, stores, etc., during the year commencing June 1st next, agreed, in view of conditions prevailing at present, that competitive tenders should not be invited. Instead, the present contracts should be renewed for a further period of 12 months on the best terms obtainable, subject where necessary to price fluctuation clauses. It was recommended that the convener, the sub-convener and a member of the sub-committee should approve the prices to be paid and sanction alterations from time to time to meet changing conditions.

Improving Domestic Conditions

Suggestions for improving the standard of living and for the way women of this country can play their part in bringing this about formed the topic of a speech made last week by Miss Caroline Haslett, adviser to the Ministry of Labour and National Service on woman power and director of the Electrical Association for Women, at a lunch held by the Women's Advertising Club of London. Women, she said, would never be properly emancipated till they had their homes, particularly their kitchens, correctly planned, with labour-saving, efficient and beautiful equipment. Greater attention must be paid to home economics and one of the developments after the war must be to make the public aware of the new services and facilities available to them.

She hoped that we should have sufficient vision to have new houses properly wired from

the start and with the apparatus already installed. Refrigerators should be available in every home, not only from the health point of view but also because they were necessary for the efficient planning of meals and housekeeping generally. More research kitchens should also be established to determine the best and most attractive food for workers in different industries. Some widening of the present training in domestic science would be needed to produce home economic experts.

Infra-red Heating

Industrial paint baking by means of "Mazda" lamp ovens is the subject of the 22-page illustrated "Infra-red Bulletin No. 1" issued by the British Thomson-Houston Co., Ltd., which is largely based on a paper which Mr. R. Maxted read about eighteen months ago before the Illuminating Engineering Society in London. This brochure treats of the type of lamp used for producing radiant heat energy, the determination of the flux densities required, reflector design, and the engineering principles involved in determining the general forms of installations suitable for drying painted and enamelled metal products.

Town and Country Planning

Speaking at the annual meeting of the Town and Country Planning Association last week, the Earl of Lytton, president, said that the Association should take some credit for the recent establishment of the new Ministry of Town and Country Planning. The new machinery provided thereby was useless, however, unless it was used, and used in the right way. Until the Ministry stated its policy the municipalities could not do anything but prepare their post-war plans on a pre-war basis and so go on repeating the mistakes of the past. A request for further financial support and personal work for the Association was made by Dr. Norman Macfadyen.

Manchester Engineers' Club

Despite the very many difficulties which the war has brought to clubs and similar institutions, the Engineers' Club, Manchester, has had a further successful year. The membership has again substantially increased, in particular the patron membership, and with the increased activities of the engineering and allied associations has been the means of enabling a favourable balance sheet to be pronuced. At the annual general meeting, held on March 30th, Mr. E. A. Mercer (Imperial Chemical Industries, Ltd.), was elected president, succeeding Mr. A. B. Mallinson, M.I.Mech.E., M.I.E.E., who retired after holding office for the maximum period of two years. Mr. E. Royle was re-elected hon. treasurer and Mr. A. G. Livesay hon. secretary for the coming year.

Flame-cutting Steel

Machine flame cutting of rolled armour plate is dealt with in a bulletin (IM/B/202) to be issued shortly by the Ministry of Supply as a supplement to the original (IM/B/201A) which is concerned with oxy-acetylene machine cutting of rolled armour plate. The new document is comprehensive, comprising five chapters on generating plant for acetylene gas, alternative gases, templets and cutting procedure, salvage of flame-cut plate and new flame-cutting machines. The last mentioned are both illustrated and described, including plate edge preparation machines that can cut two bevels and a flat root simultaneously; also a polygraph which can cut any shape with a constant angle of bevel. There is also a description of a special flame torch developed by the Department of Tank Design for both square and bevel cutting of thick armour plate, together with tables of recommended gas pressures and cutting speeds. Requests for the new bulletin should be addressed to the Ministry of Supply, D.T.D. (Welding and Gas Cutting Branch), Chobham Lane, Chertsey, Surrey.

Trade Announcement

Walmsleys (Bury), Ltd., paper-makers' engineers, Bury, have acquired a controlling interest in Ashworth & Parker, Ltd., as from March 1st, 1943. Messrs. F. O. L. Chorlton and W. S. Parker have retired from the board of the latter company and the vacancies have been filled by the appointment of Mr. John Wolstenholme, as chairman, and Mr. R. P. Timpany. Messrs. E. S. Hardman, chief engineer, and H. Sheldon, commercial manager and secretary, who have been with the company for many years, retain their seats on the board and will be responsible for the management. The company is to continue as a separate concern and concentrate as heretofore on the manufacture of high-speed steam engines, paper machine drives, etc.

Radio Institution's New Headquarters

On March 30th the British Institution of Radio Engineers held a reception at its new headquarters, 9, Bedford Square, W.C.1, to mark the opening of these new premises. Many well-known members of the radio industry were present.

Scrap Iron and Steel

The Control of Iron and Steel (No. 30) (Scrap) Order, 1943 (Stationery Office, 5d.) revokes the Nos. 14, 21, 24, 25, 27 & 29 Orders and gives new directions concerning the acquisition and disposal of scrap iron and steel; maximum prices; treatment, use and consumption; and the segregation of tungsten steel scrap.

TRADE MARK APPLICATIONS

THE following applications have been made for British trade marks. Objections may be entered within a month from March 31st:—

REMINGTON RAND (Design). No. 619,634. Class 8. Electric shaving instruments.—Remington Rand, Inc., Buffalo, N.Y., U.S.A. Address for service:—c/o Gill, Jennings & Every, 51-2, Chancery Lane, London, W.C.2.

THERMEXED. No. 622,058. Class 9. Electric wires and electric cables.—British Thomson-Houston Co., Ltd., Crown House, Aldwych, London, W.C.2. To be associated with No. 616,848 (3327) ix and another.

ELEPHANT. No. 618,709. Class 17. Tape impregnated with india-rubber for insulating purposes.—Elephant Chemical Co., Ltd., 171-173, Neate Street, London, S.E.5. To be associated with No. 618,703 (3392) i and others.

B.S.I. Publications

Revised Glossary

PART 3 of the revised edition of the British Standard Glossary (British Standards Institution, 2s. net) contains Section 3 (Switchgear) and Section 4 (Instruments). It follows the order of the 1936 edition, except for a new Subsection 37 which covers "Plugs, Sockets, etc." (comprising fourteen terms), bringing the total number of Sub-sections in Part 3 to 39 instead of 38. Definitions of several old terms have been improved or brought up to date (*e.g.*, rated breaking capacity); new terms have been added and a few redundant or obsolete terms eliminated. Fewer alternative terms have been retained, marking a further stage in the standardisation of nomenclature.

Transformer War Standards

Relaxations have been made in B.S.171 (power and lighting transformers) and to B.S. 355 (mining-type transformers). The relaxations are covered in a single document, P.D.47. Only one quality of sheet steel may now be used and non-standard designs have been eliminated. A restricted range of standard kVA ratings is specified and the production of transformers having intermediate ratings is discouraged. Copies may be obtained at 1s. net.

Electric Cables for Ships

War amendments have been made to B.S.883 for electric cables used in ships. The most important of these is the substitution of a table of dimensions of 660-V varnished cambric cables for a similar table relating to 1,000-V cables. For the first time a table for 250-V varnished cambric cables has been introduced. The pamphlet P.D.86, is obtainable at 6d. net.

Protection Against Lightning

Very little authoritative guidance on lightning protection for buildings has hitherto been generally available. Code of Practice CP.1, issued by the British Standards Institution, was drafted by a Committee set up at the request o the Society for the Protection of Ancient Buildings, but all types of structures with dangerous contents, including explosives factories have been provided for. The concise Code is followed by an appendix containing explanatory notes. The document is the first of a series to be issued under the ægis of the Codes of Practice Committee for Civil Engineering, Public Works and Building set up under the auspices of the Ministry of Works. (See *Electrical Review*, April 2nd, page 462) Copies may be obtained at 3s. 6d., post free.

Standard Electrical Installations

A code of practice for low- and medium-voltage electric wiring installations was issued by the British Standards Institution in July, 1940, at the request of the Codes of Practice Committee for Civil Engineering, etc. This code, which was drafted by a Committee of the Institution of Electrical Engineers, has now been revised and extended to high-voltage installations also and to cover larger installations than those originally contemplated.

The original portion of the code has been amended only in minor respects and constitutes Part I of the revised documents. Part 2 deals with the high-voltage and large medium- and low-voltage installations. The revised code is issued as B.S. 1062-1943 and is obtainable at the price of 1s. post free from the British Standards Institution or the Institution of Electrical Engineers.

The code is one of a series of standards dealing with wiring installations. An amendment slip PD 62 for B.S. 1063, Wiring on Cleats, may be obtained gratis from the British Standards Institution on receipt of a stamped addressed envelope. PD91 Amendments to B.S. 1064, Wiring in Conduit, and to B.S 1065, Outdoor Distribution Systems, will shortly be available.

Gift to Mr. Ferranti

TO mark the occasion of his fiftieth birthday (on February 16th), Mr. Vincent de Ferranti, chairman and managing director of Ferranti, Ltd., was presented by the directors and staff on March 23rd, with a portrait of himself in oils, painted by Cathleen Mann (the Marchioness of Queensbury). In making the presentation Mr. A. Whittaker, a director of the company, paid tribute to Mr. Ferranti who, he said, had been a director of the company for over nineteen years and had been chairman and managing

Mr. Vincent de Ferranti, from the painting by Cathleen Mann (the Marchioness of Queensbury)

director since 1930, when he succeeded his father, the late Dr. Ferranti. He expressed pleasure that Mrs. Ferranti was present and mentioned that Mr. and Mrs. Ferranti would celebrate their silver wedding next year. The contributions for the purchase of the portrait left an amount in hand, and Mrs. Ferranti had expressed the wish that this sum should be forwarded to the Oldham Infirmary where a bed was endowed to commemorate the late Dr. Ferranti. This donation would be made in the joint names of the chairman and Mrs. Ferranti.

NEW BOOKS

Problems in Physics. Power System Control Monograph.

Worked Examples in Physics. By L. J. Freeman. Pp. 186; figs. Hutchinson & Co. (Publishers), Ltd., 47, Princes Gate, London, S.W.7. Price 6s.

It is no doubt true to say that for the majority of professional men of science, including engineers, physicists, metallurgists, and chemists, the trouble taken in securing a thorough and sound knowledge of physics is a well worth while task. This is because of its frequent use and application in so many problems with which they have to deal. Like so many other studies there is no royal road to physics. He who wishes to become proficient and successful must first acquire the principles and then proceed to master the way to apply them.

This book caters for the reader who is already acquainted with principles, and is gradually feeling his way towards using them to solve practical problems. From this point of view it is an outstanding success. It contains over 190 worked problems, split up as follows :—Mechanics, hydrostatics, surface tension, elasticity (45); heat (42); light (33); sound (11); magnetism (25); and electricity (37). These are admirably selected and worked out (with diagrams in most cases) with a degree of lucidity which it would be hard to equal. Dr. Freeman has used his experience as a teacher to good effect, by indicating to the student the " how " and " why " of selecting principles for dealing with practical problems in these fields, and deserves much credit for his skilful choice.

In these difficult days, when regular classes have sometimes to be taken at inconvenient times, the use of the book by such students as profited from the tutorials of pre-war days will be found a really helpful substitute. Also it can be unreservedly recommended to all science and engineering students in higher technical colleges and universities, whether reading alone, or in conjunction with class work for any physics examination up to and including inter-B.Sc. standard.—L.J.

High Frequency Thermionic Tubes. By A. F. Harvey, B.Sc. (Eng.), D.Phil., A.M.I.E.E. Pp. 235; figs. 99. Chapman & Hall, Ltd., 11, Henrietta Street, London, W.C.2. Price 18s.

As one ascends the frequency scale in radio transmission and reception a time comes when the conventional form of thermionic valve and its associated circuits, despite modifications in design and construction, become progressively less usable, owing to a number of effects which come into play at extremely high frequencies. Not the least of these is the fact that the time taken for an electron to travel between the various valve electrodes no longer remains negligible in comparison with one cycle at these high frequencies.

The present volume explains the limitations of normal valves at very high frequencies, and then goes on to deal with specialised electron oscillators which utilise the property of electron inertia to produce oscillations. After dealing with " retarding field " generators the author gives a very full treatment of the magnetron, which occupies over a hundred pages. As Dr. E. B. Moullin says in his foreword to the book, the magnetron is a puzzling piece of apparatus, and a collected account of the work on it is most welcome. The treatment includes the results of much original experimental investigation carried out by the author in Dr. Moullin's laboratory at Oxford.

The book is completed by a chapter on the klystron, which employs electromagnetic resonators instead of tuned circuits, lecher wires or concentric lines. This chapter concludes with information on wave guides and horn radiators. With its excellent bibliography this monograph should be extremely useful to those engineers who are, or will be, associated with ultra-high-frequency technique.—W. E. M.

Electric Power System Control. By H. P. Young, M.I.E.E., M.A.I.E.E. Pp. 319; figs. 214. Chapman & Hall, Ltd. Price 25s.

The book under review is Volume XI of Chapman & Hall's well-known series of " Monographs on Electrical Engineering." The subject covers a very wide field, and the author has had to select his subject matter from a vast amount of possible material. That he had made this selection wisely can be seen from the contents of the book which might be summarised as follows :—Parallel operation and voltage control of generators; automatic regulation and synchronising; control of power by reactance; circuit-breakers; switchgear arrangements; power station interconnection; interconnector control; and automatic supervisory control. In particular, the inclusion of the chapter on remote indication and control is welcomed as communications, in the widest sense, are nowadays the *sine qua non* of a control system.

The author has made good use of I.E.E. papers and, in the case of circuit-breakers, of photographs and detailed drawings supplied by the manufacturers. A minor point of interest is that the M.K.S. system of units is employed. In general, the treatment of the subject is well balanced, theory and practice being mixed in correct proportions. No mathematical knowledge beyond elementary calculus is required by the reader. A bibliography of fifty-seven references is appended.

In spite of wartime conditions, the production of the book reaches a high standard. The book is not intended for specialists in power system control—a specialist treatise would fill many volumes of this size. It is meant rather for students and for engineers, in general, who wish to obtain a modern survey of this branch of electric power engineering; it fulfils this purpose admirably.—J.S.F.

German Ban on Lamp Sales

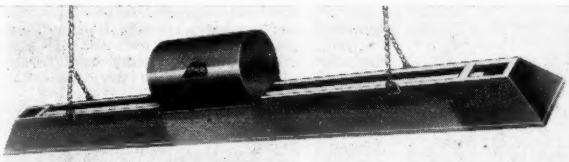
A Berlin dispatch to the German-controlled Scandinavian Telegraph Bureau states that the sale of electric lamps has been totally prohibited in Germany until August. It is explained that replacements should not be necessary during the lighter months.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Tube-Lamp Fittings

FLUORESCENT illumination tubes of the 80-V "Sieray" type are products of the Siemens lamp works at Preston, being 5 ft. long and 1.5 in. in diameter, terminating at each end in a standard two-pin bayonet cap.



Fluorescent tube-lamp fitting, open-top model

Reflector fittings for these tubes, produced by SIEMENS ELECTRIC LAMPS & SUPPLIES, LTD., 38, Upper Thames Street, London, E.C.4, include model F.9159 with an open top for allowing some light to emerge in an upward direction so as to minimise the "tunnel" effect that may be noticeable when lamps of this kind are installed in high roofed factories. The wiring to the lampholders is concealed in two beadings which run along the top edge of the reflector sides.

Model F.9160 is similar, but is closed at the top; the secret of its rigidity is the heavy flanged edge of the reflector, which is said to be superior to the normal folded edge. Readily detachable end covers conceal the lampholders. Both are constructed of lead-coated sheet-steel and are flat sided, whereas Model F.9163 is semi-circular in section. All are stove enamelled glossy white inside and sprayed grey outside, being available for either chain or conduit suspension. The associated control gear is housed in a closed compartment on the top of the reflector.

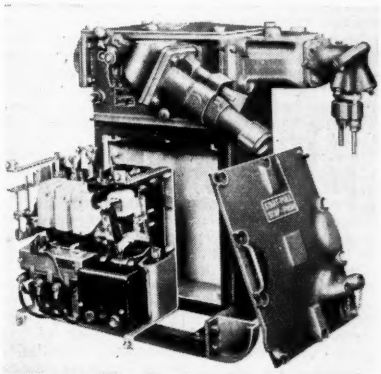
Mining Gate-end Box

Evolutionary development of gate-end boxes of the flameproof mining type for automatically controlling coal-cutters as well as conveyors and loaders enables the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester 17, to offer the MU.81 model with contactor arc boxes specially designed to retard corrosion of the internal fittings.

The isolator switch, arranged for reversing, is mounted together with busbars in a separate enclosure formed by the provision of a flameproof barrier, which the former model did not have, between the isolator and contactor chambers in accordance with recommendations of the Mines Department.

A time-delay device may now be included in the specification as an optional feature to introduce a slight lag between successive switchings, so preventing immediate reclosure of the main contactor, which will ease mechanical duty at the coal face in the event of a "fast" jib causing the cutter motor to stall frequently.

The "MV" scheme of connections provides an inherently safe pilot-earth control circuit, failure of the condenser connections or connecting leads causing the main contactor to trip so as to prevent further operation of the gear until the fault has been rectified, which necessitates removing the cover of the box. Also, when used in conjunction with "MV" pilot-earth core protection, internal short-circuits in the condenser will result in the gear tripping out and remaining so until it is reset by some authorised person. The MU.81 circuit now used is unaffected by severe voltage drop during the starting period; the remote control scheme embodied does not require the insertion of protective resistances or chokes in the pilot-earth control circuit, so avoiding chattering of the remote control relay, or risk of tripping, due to severe voltage drop caused by the heavy starting current of the cutter.



Metro-Vick flameproof gate-end box, showing self-contained removable panel

New Ottawa River Plant

Dr. T. H. Hogg, chairman of the Hydro-Electric Commission of Ontario, stated recently that work would soon be under way for the construction of a 400,000-HP hydro-electric plant on the Ottawa River at the Des Joachims Dam. The cost of the project is estimated at $40 million and it is designed to be completed in about eighteen months.

ELECTRICITY SUPPLY

Another Guildford Rebate. Assisted Wiring at Hull.

Blackburn. — CANTEEN EQUIPMENT. — At a meeting of the Town Council on April 1st, Alderman C. A. Critchley, chairman of the Electricity Committee, asked why gas water heaters were exclusively supplied to school canteens in the borough, while the Electricity Committee had had no opportunity of submitting tenders. At the Mayson Street centre gas heaters of various kinds were exclusively used, he stated. The only electrical apparatus was a refrigerator, and now they were asking for an electric fan to cool the atmosphere. Similar conditions prevailed at the King Street centre. He thought the Electricity Department should have been permitted to quote.

Alderman J. Aspin (chairman of the Education Committee) said they had no option. The apparatus had to be obtained from the Ministry of Works which paid 80 per cent. of the cost and they had to take what was supplied.

Guildford.—REBATE REPEATED.—It is announced that all consumers taking their supplies under the all-in rate for domestic, office, shop and business premises are to receive a rebate of three-quarters of the fixed charge on their March quarter accounts. A similar rebate was granted on the December quarter accounts, and it was then intimated that it was hoped to repeat the concession in the March quarter.

Hull.—ASSISTED WIRING PAYMENTS.—New tenants of houses on the Corporation's estates are required to be responsible, as a condition of tenancy, for assisted wiring payments. The city architect has drawn attention, however, to the hardship caused in the case of people who, having been bombed out of their homes, are housed in Council dwellings where the assisted wiring repayment charges have not been completed. It is suggested that as these houses are now ranging in age up to 20 years, the Housing Committee might consider taking over the responsibility for the payment of rental charges on the electrical installations during the period of tenancy, or, for the outstanding balance on the various installations, subject to a satisfactory arrangement being arrived at with the Electricity Department. This would bring the houses into conformity with the 10,000 more recently erected which have had the electrical installations included in the capital cost of erection, resulting in no additional charge being placed on the tenant. The Committee has referred the matter to the chairman, deputy chairman, city treasurer and city architect for consideration and report.

Warrington.—REDUCED CONSUMPTION.—The Electricity Committee reports that domestic consumers used 26·30 per cent. less electricity in December and 13·25 per cent. less in January than a year ago.

Overseas

Eire.—ADDITIONAL RESTRICTIONS.—The Electricity Supply Board has announced the imposition of additional restrictions on the use of electricity as from April 1st. Last autumn the "rationing" of electricity was relaxed in view of the increased water power available, consumption being limited only to the daily average in the corresponding period of the previous year. Now, however, the flow of the Shannon has been greatly reduced by the drought extending over a period of six weeks, and the output of the Pigeon House steam station is limited by the inferior quality of coal available.

The new restrictions, which are not as severe as last year, provide that, compared with the corresponding period of 1941, the use of electricity for water heating must not be more than half and cooking consumption may not exceed the 1941 amount; and for all other purposes except motive power, traction and public lighting consumption must not exceed 75 per cent.

New Zealand.—CHRISTCHURCH ENGINEER'S REPORT.—In his report for the year ended March 31st, 1942, Mr. E. Hitchcock, M.I.E.E., general manager of the Christchurch Electricity Department, states that the reduced working expenses due to the lessened labour and material available has tended to cancel out the check in the normal growth of revenue. As a result there was a revenue balance of £37,971 compared with £25,573 in the previous year. Revenue per kWh sold decreased from 0·76d. to 0·743d. (domestic 0·648d., commercial 1·556d. and industrial 0·711d.). Altogether 112·4 million kWh was sold (against 107·3 million kWh), the increase being nearly all in domestic supplies, which amounted to 63·0 million kWh (against 58·6 million kWh). The number of domestic electric ranges connected increased from 13,875 to 14,922, but sales have fallen due to prohibition of imports and increasing difficulty in local manufacture.

TRANSPORT

London.—COAL SAVING ON L.M.S.—The *Passenger Transport Journal* says that 8¾ tons of coal a day is being saved on the Euston-Broad Street-Watford electric services of the L.M.S. Railway by planned "coasting." In the operation of electric trains it is usual in order to economise in energy consumption to accelerate rapidly and then shut off power and coast to the point at which it is necessary to apply the brake for the next station stop. By calculation and experiment the L.M.S. has determined the most economical points and has fixed "coasting boards" for the guidance of drivers.

Switzerland.—GAS-TURBINE LOCOMOTIVE.—Reference is made in *Science Abstracts* to articles that have appeared in two Swiss journals relating to the first gas-electric locomotive, which has been built for express service on the Swiss Federal Railways. Comparison is made with a similar Diesel locomotive of almost identical weight and cost. The efficiencies of the Diesel at 500, 1,900 and 2,200 HP are given as 28·5, 32 and 31·5 per cent., the corresponding figures for the gas-turbine locomotive being 7·5, 15 and 13·7 per cent. It is claimed, however, that for long distances and high speeds the latter should show advantages, depending upon the difference between the prices of fuel oil and Diesel oil.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

The Clyde Valley Electrical Power Co.—In the course of his speech at the annual meeting held on March 30th, Mr. R. Robertson said he felt that while the Government should always exercise a balancing influence between State control and private enterprise, there was no justification at present for any alteration in the control or management of the electrical industry. He was satisfied that without private enterprise the electrical industry would not have reached its present stage of efficiency.

It was suggested that the primary object of companies such as theirs was to exploit the consumer in order to pay high dividends to the stockholders, and that it was therefore desirable that the control of the industry be transferred to what was described as a " non-profit-earning " board. This view was quite erroneous. One of the weaknesses of the non-profit-earning idea was that it made no provision for losses. Revenue might fluctuate for many reasons, and the surplus might be smaller than anticipated, or even be non-existent, and there was always a prospect of the surplus being insufficient to meet interest. On the other hand, the principle on which their company, in common with other power companies, was operated was that, being in constant competition with other sources of power, light and heat, they must sell it at a competitive price, and any surplus of the revenue which remained after meeting all the outgoings belonged to the ordinary stockholder and was available to pay a dividend or was ploughed back into the business.

They were in the main in agreement with the recommendations of the McGowan Committee and they had anticipated that Committee's recommendations regarding the inclusion of small isolated undertakings in larger undertakings. From time to time they had taken over a number of undertakings with considerable benefit to consumers. He felt certain that before any drastic alteration was made in the management and control of the electricity supply industry any such proposals would receive examination free from political or sectional bias.

The Northmet Power Co. held its annual meeting on March 31st, when Lord Ashfield, chairman and managing director, said that discussions between the Government Departments concerned and associations representing electricity undertakings regarding the war damage scheme were continuing, but in the absence of a definite scheme and the requisite legislation it was impracticable to arrive at any estimate of the company's liability in this respect. The company's contribution was likely to be substantial and some specific provision on account of this liability had been made out of last year's revenue.

Referring to the London J.E.A.'s scheme, Lord Ashfield said that the proposals were totally unacceptable by their company and they could not accept the contentions that were put forward in support of the scheme. Electricity must play a vital part in the field of post-war reconstruction and it was therefore essential that it should be so organised that initiative and enterprise might be brought to bear upon the difficult problems that would inevitably arise. The history of the industry demonstrated that private enterprise had made a valuable contribution to the phenomenal development that had taken place. Considerable expansion in the use of electricity was to be expected after the war and there would no doubt be many important technical developments. If this great demand was to be met efficiently and economically, and if technical progress was to be stimulated, the pioneering spirit of private enterprise must find expression in the future organisation of the industry.

The industry was susceptible to improvement, but drastic changes in the ownership and management of the principal undertakings were not necessary to remedy these defects. A wholesale reorganisation such as proposed by the J.E.A. might well have the reverse effect and delay the desirable improvements which it was within the power of existing undertakings to effect immediately with the co-operation of the Government. He suggested that the continued development of the industry in the future would best be ensured by the co-ordination of the publicly and privately owned undertakings and the delimitation of their respective spheres of influence on the lines recommended by the McGowan Committee.

The Lancashire Electric Light & Power Co., Ltd., held its annual meeting on March 30th, when Sir Joseph Nall (chairman) said that the trading results for 1942 were practically the same as for the preceding year. With regard to war damage insurance, they were still without details of the scheme for public utilities on which legislation was promised, and against this probable liability and also possible variation in taxation they were building up in the accounts of the subsidiary company a war damage and taxation reserve.

Referring to the post-war re-establishment of British industry, Sir Joseph said the electricity supply industry to-day provided a striking example of State and private enterprise, co-operating and working harmoniously for the common good, the State in this case being represented by the Central Electricity Board and private enterprise by the company and municipal undertakings. He grouped these two together because the function of municipal undertakings in electricity was more comparable to private enterprise than it was to nationalisation. The adoption of the recommendations of the McGowan Report, no doubt with some necessary adjustments, should enable the electricity supply industry quickly and effectively to meet post-war requirements in compliance with the principles stated by the Prime Minister.

He wished to give a warning of the desirability of achieving a more uniform standard of tariffs, particularly for domestic supply. This was frequently referred to merely in terms of flat rate per kWh for electric lighting, and without regard to the fact that by far the largest part of

the domestic supplies was now given on the two-part domestic tariff. In their company's case less than 3 per cent. of all electricity sold for domestic purposes was charged at the " unit " flat rate for lighting. When it came to obtaining something nearer uniformity in the two-part domestic tariffs, a complicated problem presented itself, as it was the almost universal practice of the concentrated urban undertakings to base the fixed charge on the rateable value of the house concerned. In the Lancashire area the fixed charge made by many municipal undertakings varied from 10 to 20 per cent. on the rateable value. Their own practice, on the other hand, had been to base the fixed charge on the number of living rooms and other comparable company undertakings adopted the floor space area occupied or illuminated. Shareholders would appreciate the widespread disturbance which would arise if a universal rigid standard were substituted, for while it would give reductions in some districts it would inevitably involve increases in others.

The board at the present time was going closely into the possibilities of revising the tariffs for domestic supply, but rising costs had to be taken into consideration, and to mention only one item, coal was now costing them just twice as much per ton as before the war.

Associated Electrical Industries, Ltd.—Speaking at the annual meeting on April 2nd, Sir Felix Pole (chairman) drew attention to the proposal to establish a reserve for contingencies. Nobody could foretell what expenditure would have to be incurred after the war and the directors therefore felt that the allocation of £150,000 for this purpose was justified. Referring to the maintenance of the dividend at 10 per cent., Sir Felix said that it was their practice to make complete provision for taxation on the profits of the year covered by the report. They had built up a dividend equalisation reserve of £500,000 which they could draw upon if future conditions were adverse.

Particulars of the company's activities could not be given but he could say that the orders received and the output of the works had beaten all previous records. Although the works were entirely engaged on work for the furtherance of the war effort much of this represented their normal electrical products. In this connection he would mention that they had received substantial orders for the supply of electrical plant to Russia.

Great skill had been shown in expanding and improving factory accommodation and securing the highest efficiency. In this they had the goodwill and effort of their workpeople and staff. For over twenty-five years machinery had existed for the discussion of problems and to enable close contact to be maintained between the management and all classes of employees.

The company attached great importance to the research and engineering departments. They intended to maintain and extend research, development and engineering generally. They had an able research and engineering staff and one member of the research department, Dr. C. Dannatt, had received well-earned recognition in the New Year Honours.

There was a temptation to discuss post-war problems but the important thing now was to win the war. Whatever conditions prevailed after the war he was satisfied that the A.E.I. group would not be found wanting.

The Enfield Cable Works, Ltd., reports a decrease in net profit from £217,039 in 1941 to £166,623 last year after providing for depreciation and A.R.P. expenditure. The allocation to reserve for taxation is reduced from £100,000 to £50,000 and the ordinary dividend is maintained at 12½ per cent. by a final payment of 6½ per cent. and £13,170 (against £11,547) is carried forward.

The report says that both output and the margin of profit were lower ; the demand has been for the smaller and less profitable types of cables. There was a smaller business in rubber-insulated cables and the company has had to meet the problem of producing these cables without crude rubber. To the cost of adapting machinery to new purposes was added the cost of the reorganisation begun in 1941. Stock in trade and work in progress at December 31st last were valued at £363,844 (against £395,144).

British Insulated Cables, Ltd.—At an extraordinary meeting which followed the annual meeting on April 1st a resolution was passed increasing the capital from £3,000,000 to £4,000,000 by the creation of 1,000,000 £1 shares of no defined class to be issued as the directors should determine. It was also agreed that the number of directors might exceed nine but not exceed twelve.

Worthington-Simpson, Ltd., report a net profit for 1942, after providing for tax and contingencies, of £20,607, as compared with £17,065. The ordinary dividend for the year is maintained at 7 per cent., reserve receives £5,000 and the balance carried forward is £28,189 (against £27,325 brought in).

Hall Telephone Accessories, Ltd., report a profit of £258,410 for 1942 (against £152,573). General reserve receives £25,000 (against £20,000) and the dividend is maintained at 12½ per cent. by a final distribution of 5 per cent. with a bonus of 2½ per cent.

Veritys, Ltd., are again paying an interim dividend of 7½ per cent.

A. Reyrolle & Co., Ltd., are again paying a final dividend of 7½ per cent. maintaining the year's distribution at 12½ per cent.

The West Gloucestershire Power Co. has announced a first and final dividend of 3½ per cent. (unchanged).

Heatrae, Ltd., announce the payment of a dividend of 12½ per cent. (same) for the past year.

New Companies

Reynolds & Bradwell, Ltd.—Private company. Registered March 27th. Capital, £10,000. Objects: To acquire as from March 31st the business of electrical engineers and contractors carried on by E. A. Reynolds, G. Bradwell and D. E. Reynolds at 57, Colmore Row and 12, Newmarket Street, Birmingham, as Reynolds & Bradwell; also to carry on the business of manufacturers of, and dealers in, electrical signs, radio, gramophone and cinematograph apparatus and accessories, etc. Directors: E. A. Reynolds, 89, Rednal Road, King's Norton, Birmingham, D. E. Reynolds, 160, Banbury Road, Northfield, Birmingham, and G. Bradwell, 102, Alderbrook Road, Solihull, Warwickshire. Registered office: 57, Colmore Row, Birmingham.

STARTERS

A full range is available, including all types, for A.C. and D.C. Motors, Hand Operated, Automatic, Air, and Oil Break.

SWITCHBOARDS

Of all types, Open Flat Back Type, Enclosed, Oil Immersed Non-Drawout type, and Switchboard mounting gear.

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ASTON BIRMINGHAM 6

Sales Headquarters: BRETTENHAM HOUSE, LANCASTER PLACE, W.C.2

MINISTRY OF SUPPLY

You wouldn't use a Battleship as a tug

Think of the waste of power. Think also of the waste when you use a motor that is too large for the job. This margin of size means wasted man-hours and materials. Waste in wartime is criminal.

Assess required duty accurately and determine h.p. and torque by test. 90% of this figure is the h.p. you should order
Example:—h.p. determined by test 83; 90% of 83 is 74·7—specify 75 h.p. motor and 75 h.p. control gear

Make a **SMALLER** *motor do the job*

ISSUED IN COLLABORATION WITH BRITISH ELECTRICAL MANUFACTURERS

THIS SPACE IS PROVIDED BY LAURENCE, SCOTT & ELECTROMOTORS LTD.

Kamm & Co., Ltd.—Private company. Registered March 22nd. Capital, £10,000. Objects: To acquire the business of an electrical and scientific engineer, manufacturer of kinematograph apparatus, paint projectors and oxygen generators, etc., carried on by Kamm & Co., Ltd. (in liquidation), at 27, Powell Street, E.C.1. Directors: L. P. Kamm, 15, Edmunds Walk, N.2, H. A. L. Kamm, 56, Fortis Green Road, N.2, W. G. Tucker, 129, Arcadian Gardens, N.22, and F. E. Piazzi, 56, Dalberg Road, S.W.2. Registered office: 27, Powell Street, Goswell Road, E.C.1.

S. A. Laboratory, Ltd.—Private company. Registered March 23rd. Capital, £1,000. Objects: To investigate and make known improvements in electro-acoustical and sound-producing articles and equipment, television and wireless apparatus and accessories, etc. Directors: W. L. Nicholson, C.A., Roseland, Hartley Hill, Purley, Surrey, and E. V. Wells, Langham, Portsmouth Road, Ripley, Surrey. Registered office: Imperial House, Dominion Street, E.C.2.

F. Dove & Sons, Ltd.—Private company. Registered March 24th. Capital, £1,000. Objects: To carry on the business of manufacturers of, dealers in and agents for wireless and television sets and accessories, electrical fittings, gramophones, etc. Subscribers: J. W.F. Dove, and Mrs. F. E. Dove, both of 69, Standard Road, Hounslow, Middlesex. Registered office: 77, Pimlico Road, S.W.1.

Radio Trade Service Pool (South Bucks), Ltd.—Private company. Registered March 12th. Capital, £100. Objects: To carry on the business of radio service engineers, repairers of radio and electrical apparatus, etc. Directors: R. C. Gilbert, 51, Oxford Street, High Wycombe, and four others.

Black, Ltd.—Private company. Registered in Dublin March 15th. Capital, £1,000. Objects: To carry on the business of electrical engineers and contractors, dealers in, and manufacturers of, electrical goods and appliances etc. Subscribers: P. Griffin, 116, Grafton Street, Dublin and H. Rice, 14, Wesley Road, Rathgar, Dublin.

Companies' Returns

Statements of Capital

British Brown-Boveri, Ltd.—Capital, £50,000 in £5 shares. Return dated December 10th. All shares taken up. £21,250 paid (£2 10s. per share on 8,500 shares). £7,500 considered as paid (£5 per share on 7,500 shares). Mortgages and charges: Nil.

Brookhirst Switchgear, Ltd.—Capital, £550,000 in £1 shares. Return dated January 12th, 1943. 126,002 shares taken up. £30,502 paid. £95,500 considered as paid. Mortgages and charges: Nil.

Genristo, Ltd.—Capital, £8,000 in £1 shares (3,000 preference and 5,000 ordinary). Return dated December 1st, 1942. 3,452 ordinary and 2,789 preference shares taken up. £6,239 paid. £2 remains unpaid. Mortgages and charges: Nil.

Air Ducts, Ltd.—Capital, £10,000 in 10,000 ordinary shares of £1 each. Return dated February 16th, 1943. 9,503 shares taken up. £9,503 paid. Mortgages and charges: £87,010.

Increases of Capital

Electrical & Radiological Instrument Co., Ltd.—The nominal capital has been increased by the addition of £1,000 in £1 ordinary shares beyond the registered capital of £1,000.

Electrical Screw, Ltd.—The nominal capital has been increased by the addition of £13,000, in £1 ordinary shares, beyond the registered capital of £12,000.

Mortgages and Charges

Correx Communications Equipment, Ltd.—Debenture dated March 15th, 1943, to secure all moneys due or to become due from the company to Barclays Bank, Ltd., charged on the company's undertaking and property, present and future, including uncalled capital.

Starelcarb, Ltd.—Satisfaction to the extent of £400 on December 23rd, 1942, and to the extent of £400 (balance) on March 13th, 1943, of debenture registered September 8th, 1942, originally securing £800.

Ceiba, Ltd.—Debentures, charged on the company's undertaking and property, present and future, including uncalled capital, dated March 11th, 1943, to secure all moneys due or to become due from the company to Lloyds Bank, Ltd.

Peto Scott Electrical Instruments (Holdings), Ltd.—Mortgage on contract moneys, dated March 15th, 1943, to secure all moneys due or to become due from the company to Midland Bank, Ltd.

R. G. Dixon & Co., Ltd.—Assignment on March 4th, 1943, of proceeds of contracts, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

Bankruptcies

J. Cameroff (matter No. 39 of 1935), residing at 323, Roundhay Road and carrying on business at 43, Camp Road, Leeds, and (matter No. 67 of 1929) residing and carrying on business at 147, Spencer Place, Leeds, electrical engineer.—Application for discharge to be heard on April 21st at the County Court House, Leeds.

J. W. Watson, electrical engineer, 154, Aldborough Road, Seven Kings, Essex.—Discharge granted subject to bankrupt consenting to judgment being entered against him by the Official Receiver and Trustee for £150 and £1 10s. costs of judgment. Judgment entered accordingly on March 5th, payable by instalments of £2 per month.

J. H. Matthews, electrical dealer, 232, Town Street, Bramley, near Leeds.—Last day for receiving proofs for dividend, April 15th. Trustee, Mr. H. C. Bowling, 24A, Bond Street, Leeds, Official Receiver.

G. F. Barnes, electrical and radio engineer, 1102, London Road, Leigh-on-Sea.—First and final dividend of 3s. 1½d. in the £, payable April 13th at 29, Russell Square, London, W.C.1.

D. G. Lee, electrician, 240B, Clapham Road, London, S.W.9.—Bankrupt discharged as from April 2nd, 1943.

STOCKS AND SHARES

TUESDAY EVENING.

KNOWLEDGE of the close proximity of the opening of the Budget is exercising little influence over Stock Exchange prices. The revenue returns, published last week, for the year ended on March 31st, were sufficiently satisfying from the national standpoint, to encourage a confidence that was further fortified by the Tunisian news. British Government stocks are a good market, and this firmness finds reflection in gilt-edged securities as a whole.

In New York the stock market has been indulging in a mild flare-up. The Americans, like our people on this side of the Atlantic, are studying post-war prospects, and buying for the future. What used to be the American market in the London Stock Exchange has shrunk beyond recognition. Brazilian Tractions figure amongst the remnant of negotiable stocks still left in this section, and the price is up to 25, about three times the figure to which the shares fell a few years ago. A fall of 50 points in British Electric Traction deferred looks spectacular, but when a price gets into four figures, as this has done, any fluctuation is naturally large.

Post-War Possibilities

The feature in the Home Railway market is the firmness shown by London Passenger Transport "C" stock, which from 55½ has risen a couple of points. The buying has been on behalf of people who look forward to the end of the war, and the possibility of the "C" stock receiving a higher rate of dividend than the 3 per cent. declared for last year. By comparison with other junior stocks in the Home Railway market, the return on Transport "C" is slender, but the recent buyers are content to ignore this, and to place their courage and their capital into hopes of post-war prosperity.

Private Enterprise or Public Boards

The chairman of the Clyde Valley Electrical Power Co., at the annual meeting of the company last week, made a speech which summarised the chief points of controversy discussed earlier by chairmen of other electricity supply companies at the shareholders' meetings. Mr. R. Robertson, the Clyde Valley chairman, dealt exhaustively with the pros and cons of the questions as to whether public boards or private enterprise are the better for the supply of electrical energy to consumers. He referred to the Prime Minister's recent declaration that it is vital to revive, at the earliest moment, a widespread healthy and vigorous private enterprise. Mr. Robertson's remarks are well worth reading in their entirety, answering, as they do, the doubts which have been aroused in the minds of some people by the London and Home Counties J.E.A. plan for the establishment of regional boards, and the acquisition of private undertakings.

Lord Ashfield claimed at the Northmet Power Co. meeting that expectations of important technical developments, and expansion in the use of electricity after the war, will be realised if left to private enterprise organised on the lines of the McGowan recommendations.

Electricity Supply Shares

Where changes in prices have occurred, they are in the downward direction. County of London ordinary show the principal loss with a florin fall to 38s. 4d. The other London shares are unsteady. Metropolitans receded to 38s. 6d., City Lights to 30s. London Associated at 21s. 6d. are ex dividend. Amongst provincial shares, Lancashire Light & Power show a loss of 1s. 6d. at 35s. 6d. Smaller falls have occurred in Midland Counties, North Eastern & Yorkshires. Clyde Valleys hold their previous price of 41s. Scottish Power at 40s. are ex the dividend. It is interesting to observe, from reference to our price-lists, that the average yield to be obtained from electricity supply ordinary shares at to-day's middle prices is a little more, instead of being a little less, than 4 per cent. on the money. Debenture stocks and preference shares mostly maintain their ground; indeed, London Power 5 per cent. debenture is up a point to 104½. Changes in the overseas group are few and insignificant.

A.C. Cossor

After touching 20s. the price of A.C. Cossor 5s. shares reacted a trifle to 19s. 3d., which shows a rise of 6d. on the week. Sir Louis Sterling having ceased to be a director, Mr. T. A. Macauley takes Sir Louis's place as chairman of the company. Various other changes have been made, and expectation was left wondering with which other company Cossor contemplated amalgamation. The general guess was the Philco Radio & Television Corporation. Another guess was Electric & Musical Industries, of which company Sir Louis Sterling was managing director until he resigned about four years ago, being unable to agree with his co-directors on a matter of internal policy affecting the E.M.I. company. The shares of the latter are 9d. down at 23s. 6d., public interest in the market having largely subsided. E. K. Cole are also easier at 21s. 3d.

Miscellaneous Matters

Montreal Light & Power dollar shares have risen to 28. Canadian Marconis, also a dollar stock, improved to 7s. 3d. Argentine Tramways sterling stocks and shares have again come into the limelight: the income

(*Continued on page* 502)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend Previous	Dividend Last	Middle Price April 6	Rise or Fall	Yield £ s. d.
Home Electricity Companies					
Bournemouth and Poole	12½	12½	58/6	..	4 5 7
British Power and Light	6	7	31/6	..	4 9 0
City of London	7	7	30/–	–6d.	4 13 4
Clyde Valley	8	8	41/–	..	3 18 2
County of London	8	8	38/–	–2/–	4 4 3
Edmundson's:					
7% Pref.	7	7	34/–	..	4 2 4
Ord.	6	6	29/–	..	4 2 9
Elec. Dis. Yorkshire	9	9	45/–	..	4 0 0
Elec. Fin. and Securities	12½	12½	51/–	..	4 18 1
Elec. Supply Corporation	10	10	47/–	..	4 5 0
Isle of Thanet	2	Nil	16/–		—
Lancs. Light and Power	7½	7½	35/6	–1/6	4 4 6
Llanelly Elec.	5½	6	26/–	..	4 12 4
Lond. Assoc. Electric	4	3	21/6xd	–1/6	2 15 7
London Electric	6	6	26/6	..	4 10 7
London Power Red. Deb.	5	5	104½	+1	4 15 7
Metropolitan E.S.	8	8	38/6	–1/–	4 3 2
Midland Counties	8	8	39/–	–1/–	4 2 1
Mid. Elec. Power	9	9	43/6xd	..	4 2 9
Newcastle Elec.	7	7	31/–	..	4 10 5
North Eastern Elec. Ordinary	7	7	32/6	–6d.	4 6 2
7% Pref.	7	7	35/6	..	3 19 0
Northampton	10	10	47/6	..	4 4 0
Notting Hill 6% Pref. (£10)	6	Nil	9½	..	—
Northmet Power:					
Ordinary	7	7*	37/–	..	3 15 8
6% Pref.	6	6	31/6	..	3 16 2
Richmond Elec.	6	6	26/–	..	4 12 4
Scottish Power	8	8	40/–xd	..	4 0 0
Southern Areas	5	5	23/6	..	4 5 0
South London	7	7	26/–	..	5 7 8
West Devon	5	5	23/–	..	4 7 0
West. Glos.	4½	3½	23/6	..	2 19 7
Yorkshire Elec.	8	8	40/–	–1/–	4 0 0
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	4/9	..	—
Calcutta Elec.	7*	7*	34/6	..	—
Cawnpore Elec.	10	10	30/–	..	6 13 4
East African Power	7	7	32/–	..	4 7 6
Jerusalem Elec.	7	5	25/6	..	3 18 5
Kalgoorlie (10/–)	7½	5	9/–	..	5 11 1
Madras Elec.	6*	4*	24/–	..	—
Montreal Power	1½	1½	28	+½	5 7 2
Palestine Elec. "A"	Nil	4*	38/–	..	2 2 1
Perak Hydro-elec.	6	7	9/–	..	—
Shawinigan Power	83cts.	90cts.	18½	..	—
Tokyo Elec. 6%	6	6	19	..	—
Victoria Falls Power	15	15	4	..	3 15 0
Whitehall Inv. Pref.	—	—	23/–	+6d.	—

Company	Dividend Previous	Dividend Last	Middle Price April 6	Rise or Fall	Yield £ s. d.
Public Boards					
Central Electricity:					
1955–60 (Civil Defence)	—	3	100	..	3 0 0
1955–75	5	5	115	..	4 7 0
1951–73	4½	4½	109	+1	4 2 7
1963–93	3½	3½	104½	..	3 7 0
1974–94	3½	3½	101xd	..	3 3 9
London Elec. Trans. Ltd.	2½	2½	96½	..	2 11 10
London & Home Counties 1955–75	4½	4½	111	..	4 1 1
Lond. Pass. Trans.:					
A	4½	4½	122½	..	3 13 6
B	5	5	120½	..	4 3 0
C	2¾	3	57½	+2	5 4 3
West Midlands J.E.A. 1948–68	5	5	110	..	4 11 0
Telegraph and Telephone					
Anglo-Am. Tel.:					
Pref.	6	6	113½	–1	5 5 9
Def.	1½	1½	28	–1	5 7 2
Anglo-Portuguese	8	8	24/–	..	6 13 4
Cable & Wireless:					
5½ Pref.	5½	5½	115	+½	4 15 1
Ord.	4	4	76	..	5 5 3
Canadian Marconi $1	Nil	4cts.	7/3	+9d.	2 8 9
Globe Tel. & Tel.:					
Ord.	8½*	5*	35/–	..	2 17 2
Pref.	6	6	28/6	..	4 4 3
Great Northern Tel.: (£10)	Nil	Nil	23½	..	—
Inter. Tel. & Tel.	Nil	Nil	9	..	—
Marconi-Marine	7½	7½	33/–	..	4 11 0
Oriental Tel. Ord.	16	10	37/–	..	—
Telephone Props.	6	Nil	14/–	..	—
Tele. Rentals (5/–)	10	10	10/9	..	4 13 0
Traction and Transport					
Anglo-Arg. Trans.:					
First Pref. (£5)	Nil	Nil	5/–	..	—
4% Inc.	Nil	Nil	14½	+1	—
Brit. Elec. Traction:					
Def. Ord.	45	45	1055	–50	4 5 4
Pref. Ord.	8	8	170	..	4 14 2
Bristol Trams	8	10	51/–	–1	3 18 6
Brazil Traction	$½	$1	25	+1	—
Calcutta Trams	8	5½	26/3	+3,3	4 15 8
Cape Elec. Trams	5	6	25/–	..	4 16 0
Lancs. Transport	10	10	43/3	..	4 12 4
Mexican Light:					
1st Bonds	5	5	100	..	5 0 0
Rio 5% Bonds	5	5	105½xd	+1¼	4 14 9
Southern Rly.:					
5% Prefd.	5	5	73	..	6 17 0
5% Pref.	5	5	117	..	4 5 6
T. Tilling	10	10	53/3	–6d.	3 14 5
West Riding	10	10	42/–	+6d.	4 15 3

(*Continued on next page*)

* Dividends are paid free of Income Tax.

Company	Dividend Previous	Dividend Last	Middle Price April 6	Rise or Fall	Yield £ s. d.
Equipment and Manufacturing					
Aron Elec. Ord. .	7½	10	40/–	..	5 0 0
Assoc. Elec. :					
Ord.	10	10	50/6	..	3 19 6
Pref.	8	8	40/–	..	4 0 0
AutomaticTel.&Tel.	12½	12½	58/–	..	4 6 2
Babcock & Wilcox	11	11	50/6	..	4 7 2
British Aluminium	10	10	49/3	..	4 1 4
British Insul. Ord.	20	20	5½	..	3 18 3
British Thermostat (5/–)	18½	18½	17/6	..	5 5 9
British Vac.Cleaner (5/–)	10	15	23/9	..	3 3 2
Brush Ord. (5/-) ..	Nil	6	7/9	..	3 17 5
Burco (5/-) ..	15	15	13/9	..	5 9 1
Callender's ..	15	15	4 1/16	..	3 14 0
ChlorideElec.Storage	15	15	78/3	..	3 16 9
Cole, E. K. (5/–) .	7	10	21/3	–9d.	2 7 0
Consolidated Signal	17	24	5 7/16	..	4 8 3
Cossor, A. C. (5/–)	15	10*	19/3	+6d.	3 18 0
Crabtree (10/–) ..	17½	17½	38/6	..	4 11 0
Crompton Parkinson Ord. (5/–) . ..	30	20	26/–	..	3 17 0
E.M.I. (10/–) ..	6	6	23/6	–9d.	2 11 1
Elec. Construction	10	10	42/6	..	4 14 1
Enfield Cable Ord.	12½	12½	58/–	..	4 6 0
Elecl. Switchgear (10/–)	10	10	20/–	..	5 0 0
English Electric ..	10	10	48/–	..	4 3 4
Ensign Lamps (5/–)	25	25	20/–	+ 1/16	6 5 0
Ericsson Tel. (5/–)	22†	20†	47/6	..	2 2 2
Ever Ready (5/–)..	40	40	38/6	..	5 4 0
Falk Stadelmann	7½	7½	29/–	..	5 3 5
Ferranti Pref. ..	7	7	28/9	..	4 17 5
G.E.C.: Pref. ..	6½	6½	34/3	..	3 16 0
,, Ord. ..	20	17½	89/–	..	3 18 8
Greenwood & Batley	15	15	36/6	..	8 4 4
HallTelephone(10/–)	10	12½	25/9	..	4 17 9
Henley's (5/–) ..	20	20	25/6	..	3 18 6
4½% Pref. ..	4½	4½	23/–	..	3 18 3
Hopkinsons ..	15	15	57/3	–6d.	5 4 5
India Rubber Pref.	5½	5½	20/–	..	5 10 0
Intl. Combustion	30	30	6½	..	4 16 0
Johnson & Phillips	15	15	68/–	..	4 8 3
Lancashire Dynamo	20	22½	87/6	..	5 2 8
Laurence,Scott(5/–)	15	12½	12/–	..	5 4 2
London. Elec. Wire	7½	7½	31/6	..	4 15 3
Mather & Platt ..	10	10	48/9	..	4 2 2
Met.Elec.CablePref.	5½	5½	21/3	..	5 3 6
Murex	20	20	5½	+ 1/16	3 14 6
Pye Deferred (5/–)	25	25	21/3	..	5 17 8
Revo (10/–) ..	20	17½	35/–	..	5 0 0
Reyrolle	12½	12½	65/9	..	3 16 0
Siemens Ord. ..	7½	7½	30/3	–6d.	4 19 2
Strand Elec. (5/–)	4	7½	6/9	..	5 11 1
Switchgear & Cowans (5/–) ..	10	20	15/–	..	6 13 4
T.C.C. (10/–) ..	5	5	15/–	..	3 6 8
T.C. & M... ..	10	10	47/–	..	4 5 1
Telephone Mfg. (5/–)	9	9	11/6	..	3 18 3
Thorn Elec. (5/–)..	20	20	19/3	..	5 4 0
Tube Investments	23¼	20	93/6	..	4 5 6
Vactric (5/–) ..	Nil	Nil	13/3	..	—
Vickers (10/–) ..	10	10	20/3	+9d.	4 18 10
WalsallConduits(4/–)	55	55	45/–	..	4 18 0
Ward & Goldstone (5/–)	20	20	22/6	..	4 9 0
Westinghouse Brake	10	12½	63/6	..	3 18 9
West, Allen (5/–)	7½	7½	6/9	..	5 11 2

* 5 per cent. tax-free. † Dividends free of Income Tax.

Stocks and Shares (*Continued from page* 500)

debenture hardened to 14½. Calcutta Trams, which were below 20s. a few weeks ago, have got up to 26s. 3d. again. In the home group, Bristol Trams reacted to 57s. West Riding shares are better at two guineas. The equipment and manufacturing section presents no new features of interest outside the wireless and radio shares. Ensign Lamps have advanced to 20s. bid. Murex further improved to 108s. 9d. A rise of 9d. lifted Vickers above 20s. Cable and telephone issues have moved irregularly, Anglo-American Telegraphs being dull and Cable & Wireless preference harder.

At the British Insulated Cables meeting last Thursday, an ordinary resolution was unanimously passed increasing the capital from £3,000,000 to £4,000,000 by the creation of 1,000,000 shares of £1 each. Whitehall Electric new ordinary shares are now negotiable. Dealings began at the end of last week in the £1 units; the price is about 8s. The new 6 per cent. preference have taken the place of the previous 7½ per cent. preference shares. The company should have no difficulty in earning the preference dividend. Any distribution on the ordinary is unlikely so long as the Athens undertaking contributes nothing to the company's revenue.

Voting Rights

Recent events have directed notice to the unsatisfactory position which sometime arises through the voting power being given to one class of shares in a company while another class, although ranking equally for dividend and other rights, has no say in the company's affairs. A movement is on foot to do away with this classification, and to give shares an equality in voting. As things are now, it is possible for a company to have a comparative handful of shares which can govern the voting power, while the majority is deprived of any sort of control. It may seem surprising in these democratic days that the existence of the two classes of shares should be tolerated. Under the present proposals, which are likely to receive due attention from the Government, any advantage of voting rights which one class of share may possess over another will be swept away, leaving all the shares on the same plane. This refers, of course, only to the shares upon which the dividends are a fluctuating quantity.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

AUTOMATIC Telephone & Electric Co., Ltd., and H. E. Hopley.—" Electric impulse generators." 11754. September 13th, 1941. (551,948.)

Bendix Aviation Corporation.—" Spark plugs and other electrical devices." 6663/41. July 9th, 1940. (551977.)

R. R. Birss.—" Electric impulse transmission." 12306. September 23rd, 1941. (552062).

British Thomson-Houston Co., Ltd.—" Methods of making elastic diaphragms." 12045/41. September 21st, 1940. (551995.) " Elastic fluid turbines." 7018/42. May 27th, 1941. (552007.) " Domestic washing machines." 12143/41. September 21st, 1940. (552028.)

British Thomson-Houston Co., Ltd., (General Electric Co.).—" Air-break electric circuit-breakers." 16562. December 23rd, 1941. (551966.) " Automatic systems for controlling the temperature of furnaces, ovens and the like." 13930. October 29th, 1941. (552037.) " Automatic regulation of current in alternating current load circuits." 13931. October 29th, 1941. (552038.)

British Thomson-Houston Co., Ltd., and A. H. Maggs.—" Electric phase converting motors." 11759. September 15th, 1941. (551949.)

British Thomson-Houston Co., Ltd., R. T. Coe and J. H. Pollard,—" Contact breakers for electrical ignition apparatus." 10562. July 28th., 1942. (551938.)

Budd Induction Heating, Inc.—" Strengthened cylindrical ferrous metal structures." 5322/41. April 26th, 1940. (552049).

A. C. Cossor, Ltd., and F. R. W. Strafford.—" Direction-finding radio receiving apparatus." 11747. September 13th, 1941. (551947.)

E. I. Du Pont de Nemours & Co.—" Insulating electrical conductors." 12108/41. October 18th, 1940. (552084.)

Electrical Components, Ltd., and W. Sommer.—" Massaging apparatus." July 3rd, 1942. (551933.)

Electrical Research Products, Inc.—" Electrical musical instruments." 12685/41. October 15th, 1940. (551998.) " Electrical musical instruments." 12864/41. October 15th, 1940. (552033.)

Ericsson Telephones, Ltd., and S. H. D. Ward.—" Means for the production of mouldings from thermoplastic compounds." 11879. September 17th, 1941. (552020.)

General Motors Corporation.—" Mercury interruptors." 9814/42. November 3rd, 1941. (551937.) " Machine for winding coils." 12022/41. September 27th, 1940. (552027.)

A. Graves, R. E. Prichard and Alltools, Ltd.—" Device for location of a source of radiation and/or for blind approach navigation." Cognate applications 15982/40, 12455/41 and 13091/41. November 1st, 1940. (552046.)

Hazeltine Corporation.—" Combined carrier-signal frequency detectors and control-voltage supply systems." 1658/42. November 13th, 1940. (551970.)

W. T. Henley's Telegraph Works Co., Ltd., and H. W. Breeze.—" Devices employing fuses for the protection of electric circuits." 12557. September 27th, 1941. (552030.)

H. P. Huhne.—" Electric resistances." 13069. October 10th, 1941. (552034.)

Marconi's Wireless Telegraph Co., Ltd.—" Frequency modulation." 13943/41. October 30th, 1940. (552039.) " Radio telegraphy." 15139/41. November 23rd, 1940. (552068.)

E. P. Newton (Telefonaktiebolaget L. M. Ericsson).—" Remote control systems. " 6865. May 28th, 1941. (Convention date not granted.) (551978.)

Philco Radio & Television Corporation.—" Photo-electric pick-ups for phonographs." 11845/41. September 18th, 1940. (552019.)

Philips Lamps, Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken).—" Thermionic valve circuits for generating or amplifying a control voltage." 9659. July 29th, 1941. (551981.)

Radio Corporation of America.—" Mounting of piezo-electric crystals." 12165/41. January 31st, 1941. (551954.)

Standard Telephones & Cables, Ltd. (International Standard Electric Corporation.)—" Means for measuring time intervals by impulses." 16264. December 16th, 1941. (552072.)

Standard Telephones & Cables, Ltd., F. Fairley and R. Walsh. — " Electric signalling systems." 11782. September 15th, 1941 (551951.)

Standard Telephones & Cables, Ltd., J. A. Leno and W. J. Stray.—" Electrical condensers." 11818. September 15th, 1941. (551953.)

Telefonaktiebolaget L. M. Ericsson.—" Manual switchboards." 12151/41. July 20th, 1940. (552086.)

S. D. Vigren, W. O. W. Broberg and O. K. J. Olsson.—" Selecting device for telephone and signal systems." 15984. December 11th, 1941. (552002.)

S. F. Warren.—" Electric lighting systems for portable pumping units." 11609. September 10th, 1941. (551922.)

Western Electric Co., Inc.—" Telephone image producing systems." 2607/42. March 11th, 1941. (552005.)

Rail Safety Device

THE South African Railways are to re-equip their entire system with a new device which promises to revolutionise train control. Two thousand of the instruments are to be mass-produced. The device has won for its inventor, Mr. M. C. Van Schoor, a railway employee, an award of £5,000. It eliminates relays and batteries in the train control system. If mishandled or tampered with, the mechanism stops automatically.—*Reuter.*

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Bridgwater.—April 10th. Town Council. Electrically driven centrifugal pump, together with electrical gear and accessories. Specifications from John Taylor & Sons, engineers, Artillery House, Artillery Row, Victoria Street, Westminster, S.W.1.

Glasgow.—April 30th. Lighting Department. Supply from June 1st to November 30th, 1943, of electrical fittings, etc. Specifications and forms from Lighting Department, 20, Trongate; offers to Town Clerk.

Manchester.—April 14th. Electricity Committee. Twelve months' supply of cables. (April 2nd.)

Orders Placed

London. — SOUTHWARK. — Electricity Committee. Accepted. Cables for twelve months.—Scottish Cables.

Smethwick.—Gas Committee. Accepted for electrical drive of oxide handling plant: Four motors (£41 10s. each)—Lancashire Dynamo & Crypto: four controllers (£31/1s. each), and four circuit-breakers (£15 10s. each).—E.M.B. Co.

Wallasey.—Electricity Committee. Accepted. Battery for tower wagon (£109).—Chloride Electrical Storage Co.

Worthing.—Electricity Committee. Accepted. Paper-insulated cables for twelve months.—Britannic Cable & Construction Co.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Alnwick.—Farm workers' houses (22); G. Reavell, Alnwick and G. T. Brown, Fawcett Street, Sunderland, joint architects.

Ashton-in-Makerfield.—Housing scheme; A. K. Dennis, surveyor, Town Hall.

Blaydon.—Miners' canteen at Watergate Colliery; R. C. Williamson, Strathmore Road, Rowlands Gill.

Brighouse. — Workshop, Mill Lane; R. Southern & Co., Ltd., Birds Royd, Rastrick. Workshops; Hipperholme Printing Co., Wakefield Road, Hipperholme, Halifax.

Brighton.—Control centre; borough engineer, Town Hall.

Chester-le-Street.—Communal feeding centres; M. Wilson, surveyor, R.D.C. offices.

Chesterfield.—Additional ward (31 beds); secretary, Chesterfield Royal Hospital.

Dewsbury.—Additions to premises; Mason Bros., Ltd., Bridge Street East.

Glasgow. — Workshop, etc., at 45, Byron Street for McDougall's Timber Co., Ltd.: manager.

Goole.—Nursery (£2,500), Edinburgh Street; J. H. Castle, borough engineer, Municipal Offices.

Halesowen.—Houses, Leasowes estate; G. Spurr, borough surveyor, The Council House.

Jarrow.—War-time nurseries at Simonside and Primrose; J. S. Weir, borough engineer, Town Hall.

Kidderminster.—Houses, Birchen Coppice estate; J. Hawcroft, borough surveyor, Mill Street.

Lancaster.—Adaptation of "Longlands" for nurses' home annexe; secretary, Royal Lancaster Infirmary, Lancaster.

Leicester.—Houses, New Parks estate; J. L. Beckett, city surveyor, Town Hall.

London. — HACKNEY. — Three nurseries; borough engineer.

Macclesfield.—Kitchen waste plant and building at refuse works; M. A. Tetlow, borough architect, Pear Tree House, Jordangate.

Middlesex.—Enlargement of Cranborne Junior School, Potters Bar; county architect.

Northumberland.—Reinstatement of Whitley North School (£2,100) and emergency feeding facilities at Berwick Bell Tower School (£677) and Morpeth Council School (£635); county architect, County Hall, Newcastle-on-Tyne.

Port Glasgow.—ouses; Hburghsurveyor.

Rawmarsh.—School canteen, Ashwood Road; A. J. Pugh & Co., builders, Kilnhurst Road.

Smethwick.—Canteen, Rabone Lane; George Burn, Ltd.

Southend-on-Sea.—Combined ambulance and rescue service depot (£2,832); A. & C. Lawford, Ltd., builders, Merrilies Gardens, Westcliff.

South Shields.—Extensions to the Missions to Seamen's buildings, to include an hotel, concert hall, gymnasium, etc.; H. H. Morton & Son, Martins Bank Chambers, Fowler Street, South Shields.

Stafford.—Houses at Colwich, Norbury, etc., for R.D.C.; J. W. Cook, surveyor, R.D.C. Offices, St. Mary's Grove, Stafford.

Wallsend. — Canteen kitchen at Wallsend Secondary School; F. Hope, builder, Gosforth.

Warrington.—Additions to Warrington Infirmary for orthopædic clinic; secretary.

Wednesbury.—Additional British Restaurant; A. Booth, borough engineer, Town Hall.

West Ham.—Youth centre (£1,305), site near Deanery School, Stratford; borough engineer, Town Hall, E.15.

Whittingham.—Hostel buildings; D. Glen, Back Queen's Road, Jarrow-on-Tyne.

Wigan.—Completion of transport depot; L. Lyons, borough engineer, Municipal Buildings.

Winsford.—Civic Centre for U.D.C.; P. Heaton, surveyor, Council Offices.